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VOL. II NOVEMBER, 1920 No. 4

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Articles to Appear Soon

What Teacher-Rating Schemes Measure by *R. A. Kent*

Grade Forms for a Penmanship Scale by *E. A. Nifenecker*

Group Intelligence Examinations with Blanks by *J. Crosby Chapman*

Journal of Educational Research

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VOLUME II — NOVEMBER, 1920 — NUMBER 4

COMPARATIVE RESULTS IN INTERMEDIATE AND ELEMENTARY SCHOOLS AT LOS ANGELES

THOMAS H. BRIGGS
Teachers College, Columbia University

The nine questions considered in this study are all phases of two larger problems: (A) To what extent do junior high-school pupils persist in school and (B) To what extent are secondary-education electives economically offered in the intermediate school? This study does not consider all the data necessary for the solving of these larger problems, but it does present facts and reach some conclusions that must be possessed before the problems can be satisfactorily solved.

Through the courtesy of Superintendent Shiels and with the cordial cooperation of his associates, this study concerns the schools of Los Angeles. This city was chosen for two reasons: first, because junior high schools, or intermediate schools, have been established there long enough and definitely enough for effects to be due to more than initial enthusiasm or to chance; and, second, because in that city it was possible to contrast the persistence of pupils of representative intermediate schools with that of pupils of neighboring and similar elementary schools. The schools chosen were the Fourteenth Street, the Thirtieth Street, and the Berendo Street Intermediate Schools; and the Vermont Avenue, the West Vernon Avenue, the Normandie Avenue, the Twenty-Fourth Street, the Thirty-Sixth Street, the Thirty-Seventh Street, and the Sixty-Sixth Street Elementary schools. These two groups of schools were regarded by various local school men as similar in clientele, teachers, etc.

At this point the reader should get clearly in mind the conditions imposed by the two different types of organization with

which we are dealing. Pupils transferred to senior high schools upon graduation from intermediate schools have finished the ninth grade. Those transferred to high schools upon graduation from elementary schools have finished only the eighth grade. Since those coming from intermediate schools are a year ahead of those coming at the same time from elementary schools, it is clear that those who have finished only the eighth grade must be allowed a year in which to pass through the ninth grade. Accordingly, the intermediate-school class of a given year must be compared with the elementary-school class of a year earlier. This difference of one year will bring together both elementary and intermediate groups of pupils into the same classes throughout the three upper grades of the high school.

A complete transcript was made of the record of (a) each pupil transferred June, 1913, and June, 1914, from the three intermediate schools to the senior high schools; and (b) of each pupil transferred June, 1912, and June, 1913, from the seven elementary schools to the high schools. In all 422 records of pupils from the intermediate schools were transcribed and 434 records of pupils from the elementary schools. As is usually the case, not all the transcriptions were complete or entirely accurate. In a few cases, pupils recorded as transferred to a certain high school could not be found. In other cases pupils recorded as leaving school were found to have entered high school and even to have graduated. Sometimes pupils were not recorded as having graduated from high school even though they had 32 or more credits; while a few pupils were recorded as having graduated without a sufficient number of credits. There was some inconsistency in the amount of credit recorded for a given amount of work; and the letters NM (no mark) were apparently used to indicate work uncompleted at *or* before the end of the semester. When difficulties occurred, an interpretation as intelligent as possible was made; or, in the more obscure cases, the records were thrown out. There is no reason to believe that any injustice has been done to either type of school.

Satisfactory records were transcribed as indicated in the following schedule. Among the 402 pupils from the intermediate schools there were 20 non-graduates from the Thirtieth Street School. These were sometimes counted and sometimes not,

according as graduation was or was not likely to affect the matter under consideration. Since the different bases of computation are more likely to confuse than to help the reader to understand this study, numbers have generally been transmuted into percents.

Class	Elementary School	Intermediate School
1912	178	.....
1913	235	201
1914	.....	201
Total	413	402
No. who rec'd marks in high school.....	255[a]	315

[a] Two hundred eighty were found to have been on register, but 25 did no work for which they received marks.

1. *What percent of pupils completing the eighth grade in each type of school enter the ninth grade?*—Unfortunately data concerning the persistence of pupils from the eighth grade of the two types of schools were not similarly collected, and in consequence they cannot be strictly compared. Our records for intermediate-school pupils were not obtained until the pupils had completed the ninth grade. We cannot, therefore, speak of the group of intermediate-school pupils as it was constituted when they completed the eighth grade. Of the 413 pupils who completed the eighth grade in the elementary schools, 67.8 percent were found to have been on register in the Los Angeles high schools though only 61.7 percent received marks there. To compare with this, we have only the statement published by the intermediate-school principals[1] that 87.2 percent of the 1,550 pupils who completed their eighth grade in 1914 remained in the same schools or were transferred to other intermediate and high schools in Los Angeles. Insofar as these figures are comparable, they show a marked superiority for the intermediate schools in holding pupils who complete the eighth grade.

[1] "The work of the intermediate schools of Los Angeles," *Elementary School Journal*, 15: 361–77 (375), March, 1915.

2. What percent of pupils from the two types of schools completing the ninth grade enter the tenth grade?

Here the data concerning pupils from the two types of schools are original and strictly comparable.[2] Of the 280 pupils from the elementary schools who were found to have been students in the high schools, 85.0 percent received marks in the tenth grade of the high schools. Of the 402 pupils who completed the intermediate schools, 75.1 percent were found to have entered Los Angeles high schools (i.e. the tenth grade), and 70.6 percent received marks there at the end of the first half year. These figures give support to the frequently repeated suspicion that the 6-3-3 plan of school organization would move forward the point of elimination from the end of the eighth to the end of the ninth year. Of the pupils studied, 14.4 percent more of the intermediate-school group than of the elementary-school group (the difference between 85.0 percent and 70.6 percent) dropped out between the ninth grade and the middle of the tenth.

In the article previously referred to[3] the percent of 742 pupils graduating from the intermediate schools in 1914 and entering high schools was given as 88.9. The reasons are not apparent why this percent is more than one-sixth higher than that for the smaller group used in this study.

Because of the differences between the figures found by this study and those reported by the principals, it is impossible to compare with confidence the persistence of the two groups of pupils from the eighth to the tenth grade. The best combination of the figures gives the intermediate-school group an advantage of 4 percent. Be that as it may, in weighing one type of school against the other, one must decide whether it is better for society to have 194 pupils in a thousand (87.2 less 67.8 percent) more pupils receive a ninth year of education in an intermediate school or to have 144 more in the thousand who complete the elementary grades (85.0 less 70.6 percent) receive a tenth year in the 8-4 organization.

3. What percent of the pupils prepared in the two types of schools and reaching the tenth grade persist through the remaining semesters?

[2] As the number transferred to schools in other cities or to non-public schools in Los Angeles is small (thirteen pupils from the intermediate schools and twenty-eight from the elementary schools) it has been disregarded.

[3] "The work of the intermediate schools of Los Angeles," *Elementary School Journal*, 15: 361-77 (375), March, 1915.

TABLE I. PERCENT OF PUPILS PERSISTING FROM THE TENTH GRADE

	XA	XB	XIA	XIB	XIIA	XIIB
Elementary-school group (230)	100	93	82.6	77.4	66.1	26.5
Intermediate-school group (284)	100	92.3	81.3	78.5	59.5	25.4

Table I shows that after pupils reach the tenth grade it makes practically no difference in their persistence whether they were prepared in elementary or intermediate schools. The only significant difference in the pairs of percents recorded is in the lower twelfth grade. As will be shown elsewhere, this is due to the fact that the pupils from the intermediate schools bring with them enough secondary-school credits to graduate somewhat earlier than the pupils prepared in the grammar school; some of the brighter and more industrious ones apparently graduate in two years after leaving the intermediate school.

4. *What percent of each tenth-grade group graduates?*

TABLE II. PERCENT OF PUPILS IN GRADE X GRADUATING OR STILL IN HIGH SCHOOL

	Elementary School 1912	Intermediate School 1913	Elementary School 1913	Intermediate School 1914	Elementary School 1912–1913	Intermediate School 1913–1914
Graduating from high school.....	52.6	61.8	20.7	38.7	34.8	50.3
Still in high school	9.6	2.6	37.9	16.0	25.5	9.3
Graduating or still in high school.....	62.3	64.4	58.6	54.7	60.2	59.6

By reference to Table II it will be seen that of the pupils from each type of school entering the tenth grade a considerably larger percent of those prepared in the intermediate schools have completed the high-school course of study. Even of the 1912 class in the elementary schools, whose members had nine semesters

in which to graduate, 9.2 percent fewer pupils completed the course than was the case with the corresponding 1913 class from the intermediate schools. If all of both groups still remaining in the high schools complete the course, the elementary group will still be inferior by 2.1 percent. The 1913 class from the elementary schools has graduated 18 percent fewer of its tenth-grade pupils than the corresponding intermediate-school class; and if all the pupils from both types of schools still remaining on register graduate, the elementary-school group will have a small advantage. Of course, the nearer pupils are to the end of the course, the more likely they are to continue to graduation; consequently the conclusion seems warranted that of the pupils from the two types of schools who reach the tenth grade, practically the same number graduate. Table III suggests—and the fact becomes more evident in the next section of this study—that the pupils from the intermediate schools graduate from high school earlier than their classmates from the elementary schools.

5. *What is the average number of secondary education credits brought to the high schools by intermediate-school graduates?*—The 315 graduates of intermediate schools who entered Los Angeles high schools carried with them an average of 10.2 secondary education credits. This means that on the average they had earned in the three years of their intermediate-school course just a little more than the normal amount of credit for one year of high-school work. As a great many pupils in the Los Angeles high schools earn more than eight credits a year, the intermediate schools cannot on the evidence considered claim to save any material amount of time for the average pupil. It is interesting to note that in the article previously referred to, the intermediate-school principals give the same average number of credits (10.2) as earned by their 834 graduates in 1914. They state further that the average for three years had been 11.1.

6. *What is the distribution of secondary education credits earned in the intermediate schools?*—High-school principals have argued that many pupils come to them from intermediate schools with so much advanced credit that they graduate before the senior schools have time to exert on them the influence possible in a normal three-year course. In Los Angeles I heard repeatedly of one girl who had accumulated so much advanced credit that

she was able to graduate from the high school in less than two years. Table III does not show any such extreme case. It does, however, show that provision is made for some pupils, presumably the brighter and more industrious, to earn credits that they may use toward shortening or enriching their course. But only fourteen of the pupils studied had earned credits enough to permit of their saving a half-year of their senior high-school course.

TABLE [illegible]. PERCENT OF PUPILS ENTERING HIGH SCHOOLS WITH [illegible] THAN TEN CREDITS FROM INTERMEDIATE SCHOOLS

	Percent of Pupils Receiving Indicated Credits				
	10–10.9	11–11.9	12–12.9	13–13.9	10–13.9
June, 1913	33	16	4	1	53
June, 1914	35	17	16	7	75
June, 1913 and June, 1914	35	16	10	4	65

It is pertinent to add here that the pupils from the intermediate schools, perhaps because of the opportunity that they had had for acceleration, seem to have been much more stimulated than others to earn additional credit in summer schools. Table IV shows that more than a fourth of the graduates from inter-

TABLE IV. HIGH-SCHOOL CREDITS EARNED IN SUMMER SCHOOLS

	Pupils from Elementary Schools			Pupils from Intermediate Schools		
	1912	1913	1912–1913	1913	1914	1913–1914
Pupils						
Number receiving credits	8.	18.	26.	43.	36.	79.
Percent taking summer work	6.2	11.9	9.0	29.1	23.2	26.1
Credits						
Number earned	22.9	38.5	61.4	103.1	52.2	155.3
Average per pupil	2.9	2.1	2.4	2.4	1.5	2.0

mediate schools have earned credits in summer schools, while fewer than a tenth of the graduates from elementary schools in their longer high-school course have done this extra work.

7. *Which group earns more high-school credits?*—Table V shows that the pupils from intermediate schools have before leaving school earned on the average 4.8 secondary education credits, equivalent to a half-year's work, more than similar pupils from elementary schools. If comparisons be made between the two classes that have had ample time to graduate from the high schools (elementary 1912 and intermediate 1913) the advantage is with the intermediate schools to the extent of 5.5 credits. To this must be added the fact that the intermediate schools also gave to all of their seventh- and eighth-grade pupils, whether they continued in school or not, the opportunity of doing some work in subjects ordinarily taught in high schools.

TABLE V. AMOUNT OF SECONDARY EDUCATION CREDITS EARNED

Year	Elementary-School Group		Intermediate-School Group			
	Number of Pupils	Average Number of Credits Earned in High School	Number of Pupils	Average Number of High-School Credits Earned		
				In Intermediate Schools	In Senior High Schools	Total
1912	129	23.0	.....	.....	.....	.....
1913	151	20.8	148	9.7	18.8	28.5
1914	.....	.....	155	10.8	14.0	24.8
Total	280	22.0	315[a]	10.2	16.6	26.8

[a] Including twelve at Hollywood and Gardenia.

8. *To what extent are electives which have been begun in the intermediate schools continued in the high schools?*—One of the reasons advanced for introducing as electives certain subjects into the intermediate school is that by beginning them earlier pupils may get from them a more thorough training than otherwise. This reason would justify the introduction of these subjects to the extent that pupils *successfully* continue them. The 168 pupils whose records could be traced from intermediate

schools through their high-school courses had credit in the lower school for 250 electives. Of these pupils 82, or 48.8 percent, continued their electives in the high school. Of the 82 pupils who continued their electives 63.4 percent (or 31 percent of the 168) did so successfully—that is, succeeded in getting at least one passing mark after one or more attempts. From the point of view of *subjects* instead of *pupils*, 39.2 percent of the 250 intermediate-school electives were continued in high schools. Of the number continued 62.2 percent (or 24.4 percent of the original number) were continued successfully. The records are not clear whether or not subjects were continued in advanced classes. It should be noted that these are the facts for the pupils who continued into the senior high schools. The percent on the basis of the entire number who took the electives in grades VII–IX would, of course, be much smaller.

It is of interest to know to what extent each of the electives considered was continued. Table VI, which includes, as the preceding figures did not, the records for eighteen non-graduates promoted from the Thirtieth Street School, shows the persistence by subjects. The table reads: 34 pupils elected Latin in the intermediate school, and of these pupils 12 or 35 percent elected Latin in the high schools. French has the best record, with German and bookkeeping the poorest.

TABLE VI. EXTENT TO WHICH INTERMEDIATE-SCHOOL ELECTIVES WERE CONTINUED IN HIGH SCHOOL

Subjects	Number Electing in Intermediate Schools	Pupils Electing Same Subject in High Schools	
		Number	Percent
Latin	34	12	35
German	28	7	25
French	19	12	67
Spanish	95	42	44
Bookkeeping	47	13	28
Stenography	58	22	38
Total	281	108	

9. *When pupils, having begun a subject in intermediate school continue it in high school, how do their marks in the two schools compare?*—A comparison of the average mark of the last two semesters in the intermediate schools with the marks given to the same pupils for the same subjects continued in the first two semesters in the high schools, shows that the latter are decidedly the lower. In Table VII a change of a full step (e.g., from A to B, from B to C, etc.) is indicated by 2; a change of a half

TABLE VII. DIFFERENCE BETWEEN HIGH-SCHOOL AND INTERMEDIATE-SCHOOL MARKS IN THE SAME SUBJECTS

(Plus means high-school marks were higher, minus that they were lower)

	Plus			Minus						
Difference	2	1	0	1	2	3	4	5	6	N M
Percent of pupils	2	4	16	9	28	12	11	3	1	14

step (e.g., from A to B+, B+ to B, etc.), by 1. It will be seen that in the same subjects 6 percent of the pupils secured better marks in the high school than in the intermediate school, and that 16 percent more did as well. It is apparent from data collected but not included in this study that the high schools generally give lower marks than the intermediate schools; but the facts presented in Table VII conclusively support the statements repeatedly made that the intermediate schools do not in the opinion of high-school teachers adequately prepare pupils in secondary-school subjects. The condition is worse than the table indicates, for a number of the pupils considered in this study (records do not indicate just how many) were after a trial placed in lower high-school classes than their intermediate-school records entitled them to enter; and in consequence the marks are partly for "repeated work." Probably no satisfactory articulation of work between schools, even though they be of the same rank, is possible unless there are either very detailed syllabi or objective standards for the measurement of results.

In summary, it seems that the transition from one building to another, whether at the end of the eighth or the ninth grade,

causes an increase in the number of pupils eliminated. The evidence considered in this study goes to show that the intermediate schools of Los Angeles are effective in holding a significant number of pupils for an additional year of education. Although the evidence is not clear on this point, there is probably no material difference at the end of grade x between the two groups (pupils from the elementary schools and those from the intermediate schools) as to the number eliminated. Certainly when pupils get into the tenth grade, whatever their preparation, they tend to persist about equally.

As the graduates of the intermediate schools who entered the high schools brought on the average only 10.2 credits, they could not as a group save even a half-year of the normal course in secondary education. It is shown, however, that opportunity has been afforded for the more gifted and more industrious pupils to accumulate enough advanced credits so that they may save a half year. No pupil among the number studied had enough advanced credits to enable him to save more than one semester in the three-year senior high-school course. Although they have not enabled these 402 pupils materially to decrease the length of their high-school course, the intermediate schools must be credited with having given some secondary education to pupils who have not persisted into the high school, and with having shown to others who did not continue their electives their inaptitude for the subjects. This latter result should give the high-school teachers pupils more worthy to pursue these subjects, but it also tends to count as credits toward graduation fragments of learning that are not likely to have permanency.

The intermediate schools must be credited with two other advantages: first, their graduates seem to have been stimulated to accelerate their courses by taking additional summer work; and second, on the average their graduates accumulate a half-year more of secondary education than do similar pupils who come from the elementary schools.

Fewer than one-fourth of the intermediate-school electives in the foreign languages and commercial subjects were successfully continued in the high schools. This raises the question as to whether a city can afford to offer the conventional introductory courses in foreign languages when the percent of successful

continuance is so small. Either this percent should be increased or the courses should be reorganized so as to be worth while even if they are pursued for but a half-year. It is also evident that there is need of a better understanding among teachers of the same subjects in the different schools as to what pupils should accomplish in a given unit of time.

THE RESULTS OF THREE TYPES OF DRILL ON THE FUNDAMENTALS OF ARITHMETIC[1]

F. J. KELLY
University of Kansas

The purpose of this paper is to report a study made of three methods of drill on the fundamental operations of arithmetic. The work was done under the direction of Miss Mary Schenk, now a member of the faculty of the University of Wyoming. All the material was obtained from the schools of Lawrence, Kansas. Three buildings for grades IV, V, and VI and the Central Building for grades VII and VIII were used. The study was planned and carried out with the cooperation and under the supervision of Raymond A. Kent, Superintendent of the Lawrence Schools and Professor of Education in the University of Kansas. The teachers were in hearty sympathy with the undertaking since it had been preceded by a series of tests revealing a low achievement in the city as a whole in the fundamental operations with numbers. One series of classes, representing grades V to VIII, used the Courtis Standard Practice Tests in Arithmetic; another, representing grades IV to VIII used the Studebaker Economy Practice Exercises in Arithmetic; and a third, representing grades IV to VIII used the best methods of drill which the teachers could devise, without the use of any special material. The Courtis and Studebaker exercises were used according to the directions furnished with them.

The number of children of each grade who participated in each kind of drill is exhibited in Table I.

Practically all teachers who used either type of practice material had had experience with it the year before. For those of whom this was not true, a demonstration of the proper use of the material was made by Miss Schenk before the trial period began. Furthermore, a statement of the achievements of each child in the fundamental operations as revealed by the Courtis Standard Research Test in Arithmetic, Series B was given to

[1] An address delivered before the National Association of Directors of Educational Research at Cleveland, Ohio, February 26, 1920.

each teacher at the beginning of the study. The teachers were encouraged to use this information in giving to each child the sort of drill he most needed.

TABLE I. DISTRIBUTION OF PUPILS BY GRADES ACCORDING TO EACH TYPE OF DRILL

Grade	Pupils Using Courtis Material	Pupils Using Studebaker Material	Pupils Using No Materials
IVB	0	15	20
IVA	0	20	13
VB	10	25	11
VA	20	0	13
VIB	20	0	19
VIA	16	17	24
VIIB	17	21	20
VIIA	13	11	19
VIIIB	21	20	20
VIIIA	16	17	14
Total	133	146	173

An effort was made to equalize the total amount of time consumed daily in each of the three forms of drill, including the time used in passing materials and collecting them. With this end in view and after conferring with those who had used the different materials, the following schedule was agreed upon: fourth grade, 15 minutes; fifth grade, 12 minutes; sixth grade, 10 minutes; seventh grade, 8 minutes; and eighth grade, 8 minutes. All the teachers are believed to have followed this schedule faithfully in as much as the project was regarded as a test of method, and not as a test of the teachers.

Twenty successive days were used in the study, a reduction from the original plan of thirty days made necessary by the closing of some of the schools by the board of health. A relatively brief experimental period was proposed not only because conditions could thus be more carefully safeguarded than they could for a long period but also because the teachers' interest could more certainly be maintained on a high level.

The figures which follow show the gains of classes by the three methods, the median being used as the measure of central tendency in all cases. Figure 1 is for grades IVB and IVA,[1] Figure 2 for grades VB and VA and so on. The base lines are the medians for the whole city of Lawrence. These medians rather than the Courtis standards were used in order to make comparisons from building to building more effective. The figures on the vertical scale represent the number of examples above or below the city median in speed. The percent of accuracy above or below the medians is represented on the same scale, but 1 on the scale stands for 10 percent, 2 for 20 percent, and 3 for 30 percent. In each figure the classes using the Courtis materials are shown on the left, those using the Studebaker in the middle, and those using no special materials on the right. The medians in addition, subtraction, multiplication, and division, both in speed and accuracy as determined by the Courtis test are shown by the lower end of the bar—or upper end of the hollow rectangle—at the beginning of the trial period, and by the upper end of the bar and lower end of the hollow rectangle at the end of the trial period. Thus the bars show gains and the rectangles losses during the period.

TABLE II. AVERAGE GAINS IN PERCENTS ACCORDING TO THE THREE DRILL METHODS

Method	Gain in	
	Speed	Accuracy
Courtis Practice.....	21 %	16 %
Studebaker Practice..	12 %	11 %
No special material..	7 %	10 %

As a ready means of comparing the gains under the three methods of drill, the percents which the gains were of the scores made at the beginning of the experiment were calculated for each class in each of the four processes for both speed and accuracy. These percents were then averaged for the groups of classes which worked with each form of drill. Since no fourth grades used the

[1] IVB indicates the lower half and IVA the upper half of the fourth grade.

Courtis material, only grades V, VI, VII, and VIII are figured in these averages. By this method, admittedly unscientific, the gains in percent by the three methods stand as shown in Table II.

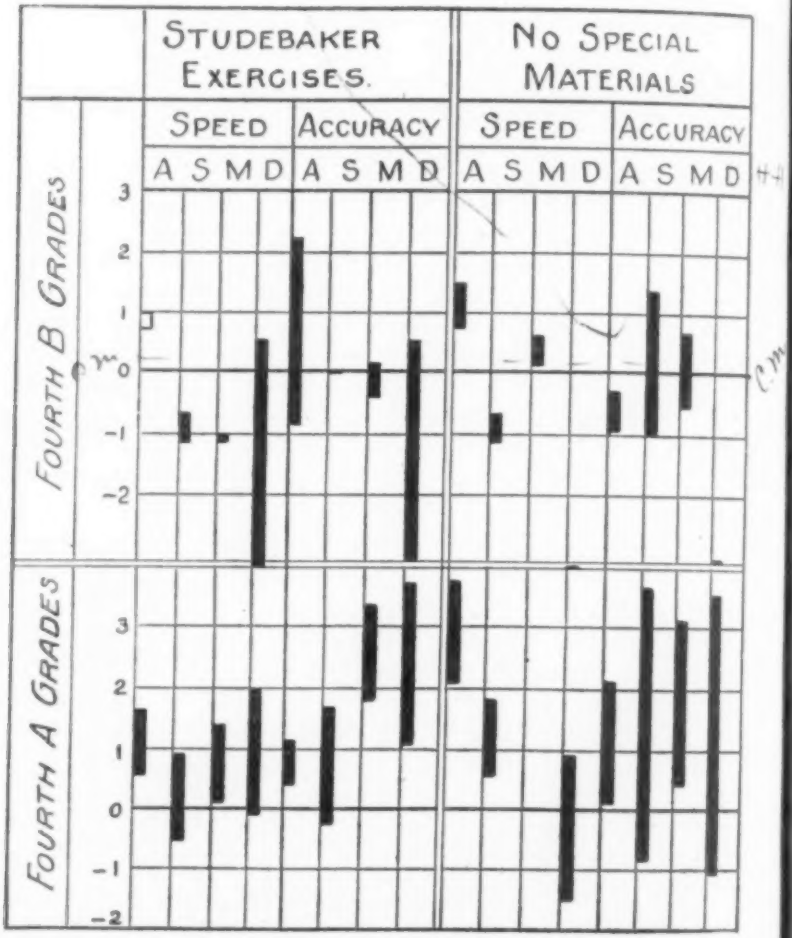

FIGURE 1. RESULTS OF DRILL IN THE FOURTH GRADE. ZERO LINES INDICATE CITY MEDIANS; BARS SHOW GAINS IN CLASS MEDIANS; HOLLOW RECTANGLES SHOW LOSSES. ON THE ACCURACY SCALE 10 PERCENT IS SHOWN BY THE SAME DISTANCE AS 1 ON THE SPEED SCALE. DEVIATIONS ABOVE OR BELOW CITY MEDIANS RATHER THAN OBTAINED SCORES ARE SHOWN.

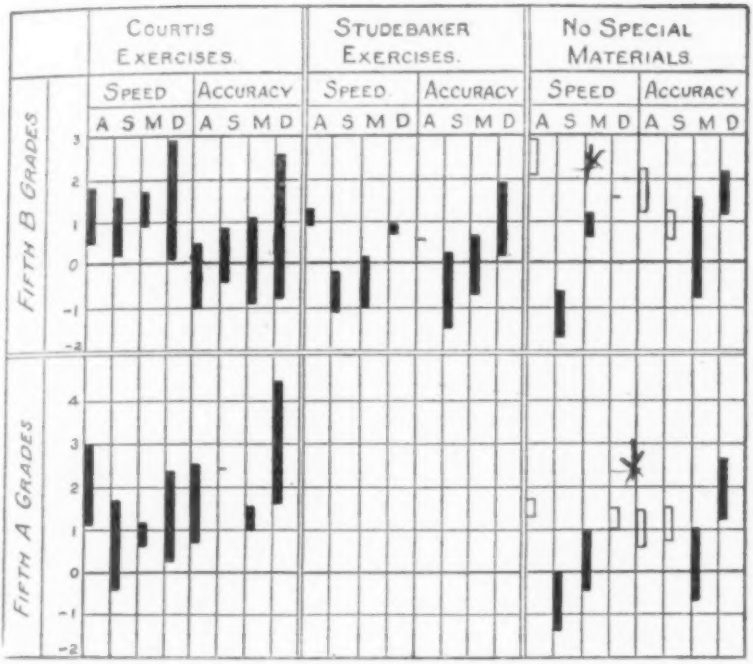

FIGURE 2. RESULTS OF DRILL IN THE FIFTH GRADE. ZERO LINES INDICATE CITY MEDIANS; BARS SHOW GAINS IN CLASS MEDIANS; HOLLOW RECTANGLES SHOW LOSSES. ON THE ACCURACY SCALE 10 PERCENT IS SHOWN BY THE SAME DISTANCE AS 1 ON THE SPEED SCALE. DEVIATIONS ABOVE OR BELOW CITY MEDIANS RATHER THAN OBTAINED SCORES ARE SHOWN.

With this explanation, it is believed the essential facts of the study are revealed in the figures.

The following conclusions seem justified by the facts:

1. The study involves too few classes and too short a period to permit a definite statement of the superiority of one method over another. The evidence must be regarded as pointing to probabilities rather than to established conclusions.

2. The amount of gain in twenty days of concentrated attention to the problem is very striking, no matter what the method.

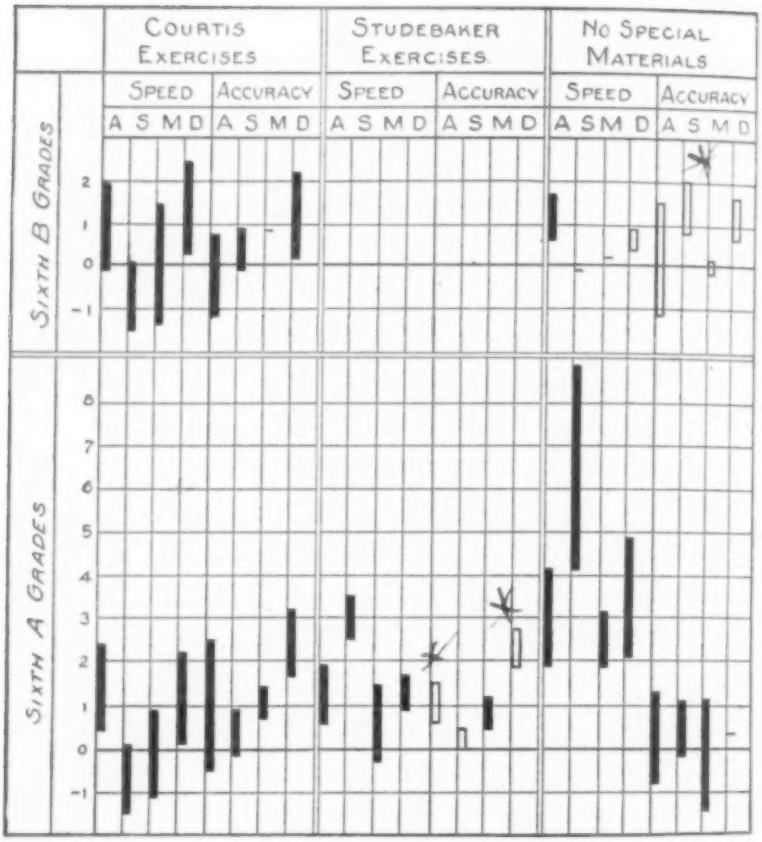

FIGURE 3. RESULTS OF DRILL IN THE SIXTH GRADE. ZERO LINES INDICATE CITY MEDIANS; BARS SHOW GAINS IN CLASS MEDIANS; HOLLOW RECTANGLES SHOW LOSSES. ON THE ACCURACY SCALE 10 PERCENT IS SHOWN BY THE SAME DISTANCE AS 1 ON THE SPEED SCALE. DEVIATIONS ABOVE OR BELOW CITY MEDIANS RATHER THAN OBTAINED SCORES ARE SHOWN.

3. The differences from class to class by the same method suggest that after all the efficiency of any method depends mostly on the teacher who is using it.

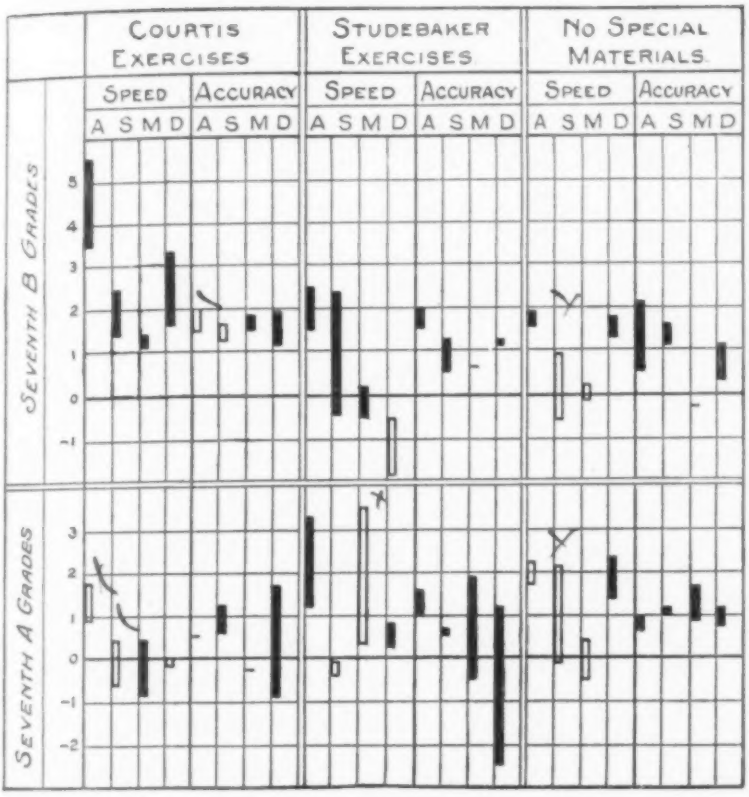

FIGURE 4. RESULTS OF DRILL IN THE SEVENTH GRADE. ZERO LINES INDICATE CITY MEDIANS; BARS SHOW GAINS IN CLASS MEDIANS; HOLLOW RECTANGLES SHOW LOSSES. ON THE ACCURACY SCALE 10 PERCENT IS SHOWN BY THE SAME DISTANCE AS 1 ON THE SPEED SCALE. DEVIATIONS ABOVE OR BELOW CITY MEDIANS RATHER THAN OBTAINED SCORES ARE SHOWN.

4. Gains by all methods were much greater in grades IV, V, and VI than in grades VII and VIII, suggesting that skills resting upon such drills should be established before the seventh grade.

5. Both the Courtis material and the Studebaker material secured greater gains than the ordinary schoolroom procedures;

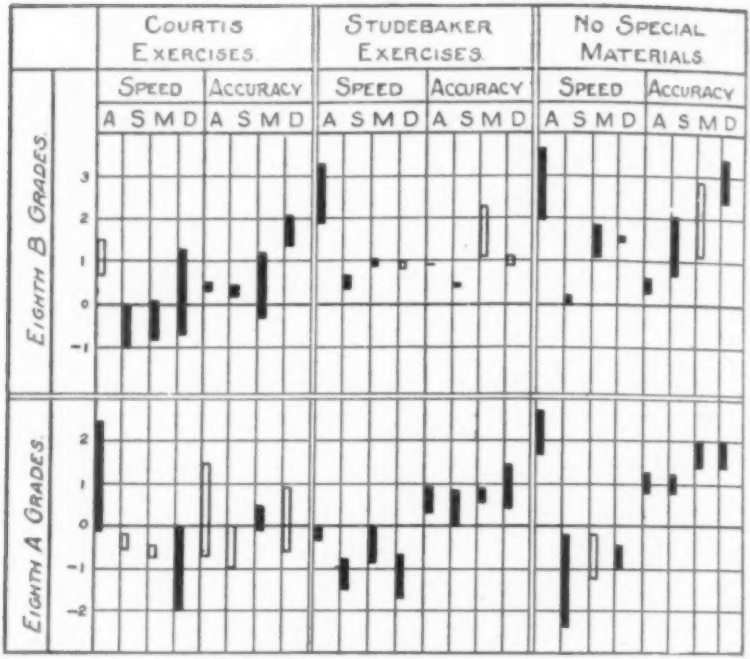

Figure 5. Results of Drill in the Eighth Grade. Zero Lines Indicate City Medians; Bars Show Gains in Class Medians; Hollow Rectangles Show Losses. On the Accuracy Scale 10 Percent is Shown by the Same Distance as 1 on the Speed Scale. Deviations Above or Below City Medians Rather than Obtained Scores are Shown.

and on the average the Courtis material secured greater gains than the Studebaker.

6. Both the Courtis and the Studebaker material secured better adaptation of drill to individual child needs than did the ordinary schoolroom procedure; and it appears that on the whole the Studebaker material secured a little better adaptation than did the Courtis. It is possible that with longer periods devoted to the experiment and a chance to bring the classes and individuals more nearly to the standards contemplated in the directions for using the drill exercises, the adaptations to class and individual differences would appear stronger in the cases of both the Courtis and Studebaker groups.

GEOGRAPHY TESTING IN BOSTON

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EXTENT OF TESTING

The Department of Educational Investigation and Measurement has given geography tests in the Boston public schools twice: the first time in 1914 and the second time in 1919. The 1914 testing,[1] for which the questions were selected with great care, was mostly limited to the eighth grade. The tests in that year were given to fourteen eighth-grade classes, four third-year high-school classes, and to the freshman class in the normal school. The subject-matter of the tests was confined to a few of the most important countries of the world, viz., the United States and the countries of Europe. The results seemed to indicate a wide distribution of effort on the part of the teachers. As a means of directly improving the character of the instruction, the geography course of study was revised, minimum essentials were defined, and a more thorough course in geography was introduced into the curriculum of the Boston normal school.

The 1919 testing was more extensive. Its scope is indicated in Table I.

TABLE I. THE EXTENT OF THE 1919 TESTING

Grade	Number of Districts	Number of Classes	Number of Pupils
VIII	7	21	735
VII	7	26	915
VI	7	29	1,080
V	7	28	1,045
Total			3,775

[1] Reported in Bulletin No. V of the Department of Educational Investigation and Measurement.

The schools were chosen from different portions of the city, so that the group tested was representative of the entire system. Because there was such a marked indication in the results from grades VI and V of the influence of the language difficulty, this article will deal only with the results from grades VIII and VII.

The purpose of the 1919 testing was not only to measure any improvement that might be due to the revision of the geography course of study but also to compare results with the standards of the Hahn-Lackey Geography Scale and to get some light on the ability of children to reason from geographical data.

The 1919 Tests for Grades VIII and VII

The test questions given in grades VIII and VII were as follows,[1] an outline map of the United States being printed at the head of the questions.

Grade VIII

1. Locate on the map the cities named at the right.
2. In the column marked "Products" write opposite the name of each city the name of a product for which the city is noted.

Cities	*Products*
Minneapolis	.....
Pittsburgh	.....
Lowell	.....
New Orleans	.....
Duluth	.....
Galveston	.....
Lynn	.....

3. Locate New York City on the map.
4. (a) Name two important crops raised in southern United States.
   (b) Tell why these crops can be grown there.
5. Why is there so little rainfall in the states just east of the Rocky Mountains?
6. Below is given a list of articles which we use in our homes. Write below each word the name of the state in which that article is produced in large quantities.

   cotton oranges cane sugar rice coal iron

7. Give reasons for the growth of Minneapolis.
8. Why are the seaports of Russia not so important as the seaports of England?
9. Of what value to the countries of Europe are their colonies in other parts of the world?
10. Give reasons why the commerce of San Francisco is not so important as that of New York City.

[1] The questions as here presented are numbered for convenience and not as on the original test sheets. The same number always refers in this article to the same question whether or not that question occurs in more than one grade.

Grade VII

(First five, same as grade eight)

a. Give two reasons why North Dakota is not as good a place to grow corn as Iowa.
b. Name four outside possessions of the United States.
c. Why is the Panama Canal an advantage to the United States in its trade with South America?
d. Why is Pennsylvania so important in iron manufacturing?
e. Name four industries based on animal products.

All of the questions of the eighth-grade test, except questions 4 and 5, were questions that had been given in the 1914 test. All the other questions in both grade VIII and grade VII including questions 4 and 5 were chosen from the Hahn-Lackey Geography Scale. Each question of the test was chosen because it was based on geographical facts that came in the geography course of study. Ten of the fifteen questions given were *reasoning* questions.

The scoring was done in accordance with the scoring of the 1914 geography test, where each question was arbitrarily assigned a value based on the number of parts into which the answers would naturally be divided. The questions chosen from the Hahn-Lackey scale were scored according to Professor Hahn's notes.

Summary of Results

Tables II and III present for each test as a whole and for each question: (a) the number of credits possible; (b) the median credits; and (c) the percent of accuracy.

It is apparent that while each of the tests as a whole is within the range of the pupil's ability, the questions vary greatly in difficulty. The results shown in this summary will be discussed in two groups: (1) a comparison of results in 1914 and 1919 on those questions of the Boston tests given in grade VIII both years; and (2) a discussion of the results attained on the questions chosen from the Hahn-Lackey scale.

TABLE II. RESULTS IN GRADE VIII AS OBTAINED IN 1919

Question	Possible Credits	Median Credits	Percent of Accuracy
1	7	5.9	68.1
2	7	6.4	77.2
3	1	1.0	58.4
4	5	3.2	53.6
5	1	1.0	60.6
6	6	4.7	65.6
7	4	1.4	24.4
8	4	1.2	19.2
9	5	1.6	24.3
10	3	1.2	24.4
Total Test	43	22.9	50.7

COMPARATIVE ACHIEVEMENTS IN 1914 AND 1919

Questions 1, 2, and 3 were not only given to grade VIII in both years, but they were also given to grade VII in 1919. The 1914 percent of accuracy (grade VIII) on each of these questions was exceeded by the 1919 percent not only for grade VIII but also for grade VII. In other words the seventh-grade of 1919 beat the eighth grade of 1914.

TABLE III. RESULTS IN GRADE VII AS OBTAINED IN 1919

Question	Possible Credits	Median Credits	Percent of Accuracy
1	7	5.9	63.5
2	7	6.1	73.9
3	1	1.0	49.5
4	5	2.9	46.9
5	1	0.9	48.9
a	2	1.2	34.8
b	4	3.8	71.9
c	2	1.2	32.2
d	1	0.7	17.7
e	4	0.8	19.4
Total Test	34	19.6	53.8

TABLE IV. RESULTS ON QUESTION 1 (LOCATING SEVEN CITIES)

Grade	Year	Percent of Pupils Earning Each Amount of Credit								Median Credits	Percent of Accuracy
		0	1	2	3	4	5	6	7		
VIII	1914	7.2	6.1	6.1	10.4	16.7	20.5	21.4	11.6	5.2	61.2
VIII	1919	10.6	2.6	4.6	6.8	10.4	15.2	21.6	28.2	5.9	68.1
VII	1919	17.9	3.1	4.8	5.7	8.5	10.7	17.8	31.5	5.9	63.5

The first line of this table shows that when the question was given in grade VIII in 1914, 7.2 percent of the pupils earned no credit, that is, did not locate any of the cities correctly; 6.1 percent earned credit 1, that is, they located one of the seven cities correctly; 6.1 percent earned 2 credits, etc. The median amount of credit earned was 5.2 credits, while the percent of accuracy was 61.2. The second line shows the same facts for grade VIII in 1919, while the third line shows them for grade VII in 1919. The reading of Table V for question 2 is similar to that of Table IV for question 1.

TABLE V. RESULTS ON QUESTION 2 (PRODUCTS OF SEVEN CITIES)

Grade	Year	Percent of Pupils Earning Each Amount of Credit								Median Credits	Percent of Accuracy
		0	1	2	3	4	5	6	7		
VIII	1914	2.3	3.7	5.7	11.3	14.2	25.4	25.1	12.3	5.5	67.0
VIII	1919	1.6	2.3	4.0	7.1	11.7	14.8	21.8	36.7	6.4	77.2
VII	1919	1.4	2.5	5.5	8.6	11.6	18.8	23.4	28.2	6.1	73.9

TABLE VI. RESULTS ON QUESTION 3 (LOCATION OF NEW YORK CITY)

Grade	Year	Percent of Accuracy[1]
VIII	1914	46.5
VIII	1919	58.4
VII	1919	49.5

[1]These percents are based on exact location.

The largest percents of error on question 1 were caused by failure to locate correctly Duluth and Minneapolis. Many who could locate a particular city in the correct state did not show its position on a body of water to which it owed its importance; for instance, more than a fifth of the eighth-grade pupils who located Galveston in the state of Texas did *not* locate it on the coast and about a sixth of those locating Duluth in Minnesota did not locate it on Lake Superior. Is it sufficient for the pupils to know merely the state in which a city is located when the growth and importance of that city are directly due to its position on coast or lake or river?

On the second question (the association of a product with each city) Duluth, Lowell, and Galveston were the cities on which pupils made the most errors, while Minneapolis seemed to be the best known.

One question keeps presenting itself to the mind of the person who scores the answers of such a geography test. It is this: "Should we not expect children to be specific in their answers?" For example, shouldn't children be expected to distinguish between raw cotton as a product of Galveston and cotton goods as a product of Lowell; between wheat and flour as products of Minneapolis; between coal and steel as products of Pittsburgh? Should we accept as an industry of Argentina the answer "wheat"? There is a large proportion of children who give such answers. Are they in the habit of giving such answers and of having them accepted? If that is so, then we are either failing to teach them to discriminate or else we are winking at a language difficulty by accepting it.

Again, when the children are asked to name one product and instead of doing so give a list of several products one or more of which may be correct, how is the teacher in the habit of dealing with this result? This practice on the part of pupils seems to be a fairly common one. Are they in the habit of giving such answers and of having the examiner pick out that which suits the case? In this test when a child gave such a list, he was given credit only if a majority of the products named were correct.

It will be seen that in 1919 only 58.4 percent of the eighth-grade children and less than half (49.5 percent) of the seventh-grade children could locate correctly New York City, the largest

and most important city of the western hemisphere. In addition, there were 13.5 percent in grade VIII and 15.4 percent in grade VII who located New York City in the interior of the state of New York. The remainder of the pupils showed no knowledge whatever of its location.

The other questions which were given to the eighth grade in both years were questions 6, 7, 8, 9, and 10. In 1919 there was a higher percent of accuracy for each question except the eighth. Table VII shows the comparison.

TABLE VII. RESULTS ON QUESTIONS 6, 7, 8, 9, AND 10. GRADE VIII

Question	Year	Percent of Pupils Earning Indicated Amount of Credit							Median Credits	Percent of Accuracy
		0	1	2	3	4	5	6		
6	1914	0.7	6.1	11.1	18.9	27.9	24.2	11.1	4.5	64.1
	1919	0.4	8.2	11.6	12.9	25.9	26.2	14.8	4.7	65.6
7	1914	43.6	37.5	16.8	2.1				1.2	19.3
	1919	31.7	45.6	16.4	5.9	0.4			1.4	24.4
8	1914	32.5	56.6	10.6	0.3				1.3	19.6
	1919	39.2	45.0	15.4	0.4				1.2	19.2
9	1914	22.1	51.8	18.4	7.2	0.5			1.5	22.5
	1919	16.6	52.0	25.6	4.8	1.0			1.6	24.3
10	1914	49.7	42.1	7.9	0.3				1.0	19.6
	1919	42.6	42.5	13.9	1.0				1.2	24.4

The differences, however, are not as great as they have been shown to be for questions 1, 2, and 3. The greatest increases, therefore, over the percents of 1914 are on the first three test questions—and it will be observed that they are fact questions. These large increases are probably due in large measure to the revision of the geography course of study which aimed at the definition of minimum essentials with concentration on a comparatively small number of important geographical facts.

The advantage over 1914 in the case of the thought questions is mainly due to a decrease in the group having complete failure.

Take question 7, for example. There were 37.5 percent in 1914 who could give only one factor contributing to the growth of Minneapolis; in 1919 this percent was increased to 45.6 while comparatively few in either year told more than one of the important factors contributing to the growth of that city.

Again, in question 8: "Why are the seaports of Russia not so important as those of England?" and in question 10, "Why is the commerce of San Francisco not so important as that of New York City?" very few pupils gave more than one reason.

The question has been raised as to how many reasons the children should be expected to give in answer to the general "Why?" Do they think they are fulfilling the requirements of the question when they give one reason? That does not seem to be generally true. They tell as many as they know.

Achievement on Hahn-Lackey Questions

Seven of the questions, 4, 5, a, b, c, d, and e, were chosen from the Hahn-Lackey Geography Scale. Each of the questions was chosen because the facts on which it was based formed part of the course of study of the specific grade or of an earlier grade.

Table VIII shows for each question the grade or grades in Boston in which it was used as a test question, the letter and number indicating its position on the Hahn-Lackey scale, the standard percent of achievement recommended by the scale, Boston's percent of achievement, the advantage in favor of Boston, and whether the question is a thought or a fact question.

It is noticeable that only in the case of the fact question does the Boston percent exceed that of the scale. Again, low percents on thought questions are noticeable. It is evident that standards in geography should be based on material that has been specifically included in the course of instruction, if we are to use them to judge the quality and result of instruction.

Reasoning Questions

There are still large numbers of pupils who fail to give even one reason in answer to a thought question. This is particularly apparent in questions 8, 10, a, c, and e, where the percents of pupils who completely failed were 39.2, 42.6, 39.3, 37.9, and 59.6 respectively. This does not necessarily mean that we are

TABLE VIII. COMPARISON OF ACHIEVEMENT AT BOSTON WITH HAHN-LACKEY STANDARDS

Question Number	Grade	Scale Letter and Number	Hahn's Percent for Question	Boston's Percent of Achievement	Advantage in Favor of Boston	Thought or Fact Question
4	VIII	O 66	66	53.6	−12.4	both
	VII	O 66	66	46.9	−19.1	both
5	VIII	P 77	73	60.6	−12.4	thought
	VII	P 77	73	48.9	−24.1	thought
a	VII	L 116	42	34.8	− 7.2	thought
b	VII	N 208	58	71.9	+13.9	fact
c	VII	P 78	73	32.2	−40.8	thought
d	VII	J 137	27	17.7	− 9.3	thought
e	VII	K 181	34	19.4	−14.6	thought

expecting too much in the field of reasoning from geographical data. It may mean that the problem is not yet sufficiently recognized. However, we can certainly require as a minimum results equal to the median achievement on each question.

The Shortened Form of Test

In many cases it will be desirable to use a shortened form of test as typified by the following form of questions 7, 10, and d.

7. *Give reasons for the growth of Minneapolis.* (Check 4)
   1. Men from New England are going there and making it an important city.
   2. It is the center of a great lumber region.
   3. It is the center of a great wheat region.
   4. Minneapolis is the largest city of Minnesota.
   5. Minnesota is a larger state than Massachusetts.
   6. St. Paul and Minneapolis are often called the twin cities.
   7. The Mississippi River is navigable as far as Minneapolis.
   8. The people of Minneapolis are prosperous.
   9. St. Paul and Minneapolis together have a population of more than half a million.
   10. Minneapolis is not a seaport.
   11. There are many small lakes in Minnesota.
   12. Minneapolis has fertile soil for agriculture.
   13. Immigrants are flocking to Minneapolis.
   14. It is a great railroad center.

15. The Great Lakes can be used for commerce.
16. The Falls of St. Anthony furnish water power for the mills of Minneapolis.

10. *Give reasons why the commerce of San Francisco is not so important as that of New York City.* (Check 3)
    1. San Francisco is farther from the countries of the Eastern Hemisphere than New York.
    2. The people of San Francisco are not so progressive.
    3. San Francisco is shut in by mountains more than New York.
    4. It is more expensive to send things from San Francisco.
    5. San Francisco has a smaller population than New York.
    6. Asia is not so important commercially as Europe.
    7. There are many Chinese in San Francisco.
    8. There is no city on the western coast that has such a good harbor as San Francisco.
    9. California is a great fruit-producing region.

d. *Why is Pennsylvania so important in iron manufacturing?* (Check 1)
    1. There are mountains running through it.
    2. Pennsylvania has many rivers.
    3. It manufactures more than any other state.
    4. It is a railroad center.
    5. Pennsylvania has a dense population.
    6. There are many different things mined in Pennsylvania.
    7. Iron is found there and coal is easily obtained.

Such a test eliminates the language difficulty, simplifies the correction of results, and saves time in writing. It may be used when the object is simply to get a measure of the ability of an individual or group, as investigation seems to show that the reliability of the scores is just as great.

The Value of the Usual Type of Test

However, the usual type of question—the type used in this testing—has values which the shorter type illustrated above for questions 7, 10, and d does not have. The child's wrong answers give us valuable knowledge as to his understanding of certain facts and as to his reasoning from them. We are thus able to correct wrong impressions. Too often, in our contemplation of right answers, we disregard the significance of wrong answers. Take, for instance, the question: "Why is there so little rainfall in the states just east of the Rocky Mountains?" Only 61 percent in grade VIII and only 49 percent in grade VII showed any

knowledge of the *real* cause. Of those who hadn't any knowledge of the real cause this is the type of answer given.

The mountains keep the rain absorbed on their tops and it doesn't fall much.

The mountains are so high that the rain doesn't get a chance to land on the ground.

The mountains are high and the cloud hits them and knocks off rain.

The mountains support the states.

The wind blows the rain on the other direction and it slides down the mountain.

Here is seen an absolutely wrong conception of the effect of mountains on rainfall. Then again, in answer to the question "Give reasons for the growth of Minneapolis," these are given: "When seaports are open they get frozen," "Men from New England are going to Minneapolis and making it an important city." It is true that the new type of examination gives us a reliable index of the percent who have attained accuracy and that it requires relatively little labor in scoring results. Yet after all one of the chief values of the traditional type of test—and one that is being so often overlooked—is the opportunity it offers to make effective use of the child's answers to questions.

Among the important facts brought to light then as a result of the geography testing in Boston are these:

1. The definition of minimum essentials in geography brings a higher percent of accuracy in results on fact questions.

2. Inasmuch as the eighth-grade test ranged from a question on which the pupils achieved an accuracy of 77 percent to one on which they achieved an accuracy of 19 percent, it shows that the test as a whole is within the ability of eighth-grade pupils. The range on the seventh-grade test was practically the same.

3. Any geography standard which is designed to be used as a basis for evaluating the results of geography instruction should be based upon subject-matter *taught*. Otherwise it is based upon general knowledge and becomes useless as a basis of comparison just as soon as the material has been taught.

4. It does not seem sufficient for pupils to know the state in which a city is located when the growth and importance of the city are directly due to its position with reference to physical features.

5. Many children do not distinguish between raw and manufactured products, nor between products and industries. This is either a language difficulty or a lack of discrimination which is not recognized.

6. Thought questions are almost always more difficult than fact or location questions. There is no standard as to what we should expect in the ability to reason from geographical data but at least we should expect results equal to the median achievement of the pupils in the Boston test.

7. If a test is to be used to measure the ability of an individual or a group on one or more questions the shortened form of examination is useful. While there are difficulties in its construction, it is far simpler to administer.

8. While the traditional type of test (as used here) does give a measure of ability, its scoring is subjective. There is danger in establishing standards based on such a test unless this is clearly recognized. Definite statements as to accepted answers to each question should be made available by those on whose judgments the standards were set up.

9. One of the chief values of this kind of test lies in its disclosure of the child's understanding of certain facts and his reasoning from them. There is a wealth of material here which is too often disregarded. Our clearer understanding of the reasoning problem in geography will come through this analysis.

THE CLASSIFICATION OF SCHOOL CHILDREN ACCORDING TO MENTAL AGE

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Ohio State University

The increasing realization of the necessity for more uniform grouping of children according to mental age rather than according to chronological age has already resulted in some experimental work. It may therefore be helpful to describe the experience we have had in this connection with one school during the past year. The opportunity afforded us was due to the cooperation of the principal, Mrs. Scatterday, who has for a long time been interested in psychological tests and who has used the results of such tests with rare ability and discrimination. We wish here to tender our thanks for her constant help and deep interest.

The Northwood School of Columbus, Ohio, in which the work was done, is a public elementary school in a very good section of the city. It has an enrollment of about five hundred pupils and contains only grades I to VI. All the children in grades I to V were tested during the first semester of 1919–1920. Those in grade VI were not tested because they would shortly enter the junior high school. The Stanford Revision of the Binet Scale was used throughout. Grades II to V were tested under the direction of the writers, and grade I under the direction of Doctor J. E. Evans of the Ohio State University, to whom the writers are indebted for the opportunity of using his results.

THE RESULTS OF THE TESTS

Table I shows the actual distribution in the five grades as shown by the tests. The rows show mental age while the columns show grades. The zig-zag lines inclose the entries of pupils of normal mental age, allowing one and one-half years for each half grade. The mental age of 6–6 to 6–11 may be considered normal for the IB grade,[1] because a child usually enters school between the ages of 6 and 7. Mental age of 7–0 to 7–5 is typical of the IA, as ordinarily children have been promoted from IB by

[1] "B" indicates the lower half and "A" the upper half of a yearly grade. In writing ages, 6-11 means 6 years, 11 months and similarly for other expressions of the same kind.

TABLE I. ACTUAL DISTRIBUTION OF PUPILS BY MENTAL AGE AND GRADE AT THE TIME OF TESTING

Mental Age	Grade										
	IB	IA	IIB	IIA	IIIB	IIIA	IVB	IVA	VB	VA	Total
4-0 to 4-5	1										1
4-6 to 4-11	3										3
5-0 to 5-5	1										1
5-6 to 5-11	7										7
6-0 to 6-5	11	2	1								14
6-6 to 6-11	18		4		1		1				24
7-0 to 7-5	22	5	10	4	1						42
7-6 to 7-11	15	3	7	4	8	1					38
8-0 to 8-5	3	1	15	4	15	4	1				43
8-6 to 8-11		2	8	8	16	8	4	2	6	1	55
9-0 to 9-5			6	5	5	6	12	5	6	1	46
9-6 to 9-11		1	4	2	2	6	15	5	4	2	41
10-0 to 10-5					1	4	12	2	5	6	30
10-6 to 10-11					2	5	7	7	8	4	33
11-0 to 11-5							5	6	6	7	24
11-6 to 11-11						1	5	2	4	3	15
12-0 to 12-5							1	5	2	5	13
12-6 to 12-11						1	1		5	3	10
13-0 to 13-5									2	1	3
13-6 to 13-11										1	1
14-0 to 14-5									2	1	3
Over 14-6								1		2	3
Total	81	14	55	27	51	36	64	35	50	37	450

the age of 7. Similarly, six months may be allowed for each half grade. This range of six months for each half grade is, however, rather narrow; and a school judged by displacements outside of this narrow range shows a very large percentage of displacements. We have, therefore, indicated a wider range by means of the zig-zag lines. This range allows one and one-half years for each half grade. Thus, IB reaches from 6–0 to 7–5, and IA from 6–6 to 7–11, and so forth. The table is to be read as follows, beginning at the upper left-hand corner: One pupil having a mental age between 4–0 and 4–5 is found in IB; of those having mental ages from 4–6 to 4–11 three are found in IB, and so forth. At the extreme right is the total number of cases at each mental age, and at the foot is the total number in each grade.

Allowing one and one-half years to each half grade, 27.6 percent of the pupils were classified as below normal. These pupils were in grades below those to which, according to their mentality, they should have belonged. On the same basis, 55.3 percent of the pupils were normal, and 17.1 percent were above their normal grades. Since more than one-fourth of the children are bright enough to be in higher grades, there is evidently large wastage of good mental material—a wastage such as we always find in schools made up of children of good mental ability.

According to Table I, 77 pupils, or 17.1 percent, are above normal; 249, or 55.3 percent, are normal; and 124, or 27.6 percent, are below normal.

The Level of Intelligence

That this school has more than the average number of bright and superior children can be seen from Table II, which shows the distribution according to Intelligence Quotients of the 450 cases. Table II may be read as follows, beginning at the upper left-hand corner: Of feeble-minded children—i.e., of those having intelligence quotients between 0 and 69—one was found in IB, one in IIA, one in IVB, etc. The total number of children of this level of intelligence was 7, or 1.6 percent of the entire number tested. The last column shows the percents for each group. The distribution is skewed decidedly toward the superior group and shows that the mental make-up of the children is, in general, above normal. We note that the normal group contains almost

50 percent. The bright group contains 21 percent in comparison with only 11 percent in the backward group. The very bright group contains 8 percent as compared with the 4 percent in the borderline group, and the very superior group contains over 4 percent as compared with less than 2 percent in the feeble-minded group.

TABLE II. GRADE DISTRIBUTION OF PUPILS ACCORDING TO INTELLIGENCE QUOTIENTS

Diagnosis	Intelligence Quotients	Grade										Total	Percent
		IB	IA	IIB	IIA	IIIB	IIIA	IVB	IVA	VB	VA		
Feebleminded	0— 69	1	...	....	1	.....	.....	1	.....	1	3	7	1.6
Borderline...	70— 79	3	...	2	2	3	.....	1	2	3	3	19	4.2
Backward...	80— 89	5	1	5	1	7	4	3	4	11	8	49	10.9
Normal.....	90—109	33	11	27	15	30	14	35	19	25	14	223	49.6
Bright.....	110—119	30	1	12	5	8	9	13	4	7	5	94	20.9
Very bright..	120—129	9	...	4	3	2	5	8	4	2	1	38	8.4
Very superior	130—	...	1	5	....	1	4	3	2	1	3	20	4.4
Total.....		81	14	55	27	51	36	64	35	50	37	450	100.0

The Reclassification

The results of the tests were used in determining the promotions at the beginning of the second semester in February, 1920. Because of having high mental ages and intelligence quotients, 47 pupils were given an extra promotion of a half grade—that is, a half grade more than the promotion which would have normally occurred at this time. Twenty-two were given an extra promotion of a whole grade. In regard to intelligence quotients, these cases were distributed as shown in Table III.

TABLE III. DISTRIBUTION ACCORDING TO INTELLIGENCE QUOTIENTS OF PUPILS RECEIVING EXTRA PROMOTION

Intelligence Quotients	No. of Cases	No. Promoted an Extra Half Grade	No. Promoted an Extra Whole Grade
90– 99	1	1	.....
100–109	10	4	6
110–119	20	17	3
120–129	22	16	6
130–139	10	7	3
140–149	5	2	3
150–159	1	.....	1
Total.....	69	47	22

Because of low mental ages and intelligence quotients, six pupils were demoted a half grade, and one was demoted a whole grade. That is, these pupils were demoted that much below their former grade. They had mental ages and intelligence quotients, and were demoted as indicated in Table IV.

TABLE IV. MENTAL AGES AND INTELLIGENCE QUOTIENTS OF DEMOTED PUPILS

Mental Age	Intelligence Quotient	Grade	Grade to Which Demoted
8–10	91	IVA	IVB
9–2	84	IVA	IVB
8–2	91	IIIA	IIIB
6–4	79	IIB	IA
6–8	84	IIB	IA
7–0	93	IIB	IA
7–3	90	IIIB	IIB

Because of rather low mental ages and intelligence quotients and unsatisfactory work, 41 pupils were retained in their former grade.[3] They were distributed according to their intelligence quotients as shown in Table V.

50 percent. The bright group contains 21 percent in comparison with only 11 percent in the backward group. The very bright group contains 8 percent as compared with the 4 percent in the borderline group, and the very superior group contains over 4 percent as compared with less than 2 percent in the feeble-minded group.

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Borderline...	70— 79	3	...	2	2	3	.....	1	2	3	3	19	4.2
Backward...	80— 89	5	1	5	1	7	4	3	4	11	8	49	10.9
Normal.....	90—109	33	11	27	15	30	14	35	19	25	14	223	49.6
Bright.....	110—119	30	1	12	5	8	9	13	4	7	5	94	20.9
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6–4	79	IIB	IA
6–8	84	IIB	IA
7–0	93	IIB	IA
7–3	90	IIIB	IIB

Because of rather low mental ages and intelligence quotients and unsatisfactory work, 41 pupils were retained in their former grade.5 They were distributed according to their intelligence quotients as shown in Table V.

TABLE V. DISTRIBUTION OF PUPILS NOT PROMOTED

Intelligence Quotients	Number of Pupils
80– 89	16
90– 99	21
100–109	4
Total.....	41

In order to help the pupils cover the extra work involved in their rapid promotion, a special teacher devoted full time to tutoring. Two types of tutoring classes were organized. Before the end of the first semester, where it was possible to predict the extra promotion, the pupils were given work in advance of their grade, in addition to their regular work, the aim being to prepare them to take up the work in the new grade into which they would be promoted. After the general shifting at the beginning of the second semester and the pupils were in their new grades, they were tutored on the work between their old and new grades. After having had experience with both methods of tutoring, the teacher gave it as her opinion that the before-promotion tutoring was most successful in studies depending on preceding work in the same subject, as in arithmetic. She considered the after-promotion method satisfactory in studies not depending on preceding work, as geography.

Two classes were formed for especially bright children, one in the IA grade, the other in the IIA grade. The special class in the IA grade was created in order to assemble children of the same mental caliber. It contained 28 pupils of regular IA promotion with intelligence quotients ranging from 110 to 128. Eight others in the class either had not been promoted from, or had been demoted into that grade. The intelligence-quotient distribution of the pupils in this special IA class is given in Table VI.

In the *regular* IA grade pupils having intelligence quotients from 90 to 110 were put in a class by themselves and given regular IA work. Those having intelligence quotients below 90 were put into the IB grade.

TABLE VI. DISTRIBUTION OF PUPILS IN THE SPECIAL IA CLASS

Intelligence Quotients	Number of Pupils	
	Promoted	Retained or Demoted
70– 79	0	1
80– 89	0	4
90– 99	0	3
100–109	0	0
110–119	20	0
120–129	8	0
Total.....	28	8

The special class in the IIA grade consisted of 23 pupils having intelligence quotients from 110 to 135. Twenty of these would have been in the IIA grade by normal promotion, while three would have been in the IIB. In collecting this group of bright children in IIA instead of giving them extra promotion, the aim was to broaden their education as well as to allow them to progress faster. In arithmetic they were to be drilled in accuracy; and in language they were to be given much oral work to broaden their vocabulary and to enable them to talk fluently.

An ungraded class was formed in which 16 pupils with low intelligence quotients were given individual teaching. These pupils were collected from the various grades, and each one was given special care. Their distribution according to intelligence quotients is given in Table VII.

TABLE VII. DISTRIBUTION OF PUPILS IN THE UNGRADED CLASS

Intelligence Quotients	Number of Pupils
0–59	1
60–69	3
70–79	10
80–89	1
90–99	1
Total.....	16

Extra Promotion

As we have stated above, 69 children were given extra promotions of a half or whole grade. All of these cases were carefully studied by Miss Vogt, the coaching teacher, who gave them extra work for varying periods until they had made an adequate adjustment to their new classes. Much of the ultimate success of this experiment was due to the interest and understanding displayed by the coaching teacher, and we can not emphasize too strongly the need for this type of constructive teaching after the psychological tests have pointed out the discrepancies in the placement of the children. The coaching work was regarded as a privilege by the pupils and not as an extra burden, and this must, of course, always be the case if the work is to prove successful.

Careful notes were kept by the coaching teacher. Some of the remarks are interesting enough to be given here:

E. A.—Chron. Age 11–2. M. A. 14–3. I. Q. 128. Promoted from VB (Sept.) to VIA (May). In May he stands highest in his class. He has rapidly matured since his rapid promotion and has risen fully to his opportunities.

V. T.—Chron. Age 10–11. M. A. 16–3. I. Q. 148. Promoted from VA (Sept.) to VIA (May). Her school days would hardly total two full years, due partly to physical weakness and partly to a mother with radical ideas. Covered decimals in only two or three coaching lessons. Especially bright in English. After having skipped a half grade, she was out of school two months, yet enters class and gets "Excellent" in all her grades.

M. L.—Chron. Age 9–8. M. A. 12–6. I. Q. 128. Promoted from VB (Sept.) to VIB (May). Former teachers predicted failure because she never showed any interest in school work. The double promotion seemed to stimulate the girl to take some interest in her work. "Her weak grasp of a piece of crayon changed to reliant firmness."

G. C.—Chron. Age 8–3. M. A. 11–10. I. Q. 145. Promoted from IIIA (Sept.) to VB (May). No one suspected her ability but she has surprised everyone by making good.

L. E.—Chron. Age 11–7. M. A. 12–7. I. Q. 109. Promoted from VB (Sept.) to VIB (May). Apparently of a light nature, not given to hard work, but shows improvement in interest. Disappointed his teachers. "Still have hopes that the skipping will be of benefit eventually."

R. T.—Chron. Age 11–3. M. A. 12–5. I. Q. 110. Promoted from VB (Sept.) to VIB (May). Not up to the rest of the class in arithmetic, but responds to personal teaching. Later the teacher said of him that he was mischievous and had disappointed his teachers.

I. A.—Chron. Age 8–2. M. A. 10–10. I. Q. 133. Promoted from IIIB (Sept.) to IVA (May). Does not live up to his privileges. Is slow in reading and arithmetic.

These are samples of the best and poorest records of the children given extra promotion. Only two children, according to the principal, failed to make good, and we are positive that the very few disappointments experienced in this respect were due to the careful selection of cases in the first place by means of accurate mental tests.

Survey of the School after Reclassification

Let us now compare the school as a whole at the time of testing with the condition on May first, after the reclassification had been made and after it had become more or less permanent. Table VIII shows the actual distribution of 370 pupils at the time of testing. These 370 pupils are those of the original 450 who were tested during the first semester and who were still in school and in grades IA to VIB inclusive on the first of May. The remaining 80 do not appear for the following reasons: (1) removal; (2) classified in the ungraded individual class; or (3) found in the IB or VIA grades on the first of May. According to this table, 13 percent are classified above their normal grade, 56.7 percent are in their normal grade, and 30.3 percent are below their normal grade.

Table IX shows the actual distribution on May first of the 370 pupils who appear in Table VIII. The IB and VIA grades do not appear in this table since at that time there were a number of pupils in these grades who had not been tested. In Table IX the pupils are classified, not according to the mental ages found when they were tested, but according to their mental ages on May first as estimated from their intelligence quotients. For instance, suppose a pupil had a mental age of nine and an intelligence quotient of 115 at the time he was tested, say the last of October, chronologically, he would be six months older by the first of May. But assuming that he had been maturing mentally according to his intelligence quotient, his new mental age would exceed his former mental age by almost seven months. He would therefore appear in Table IX as having a mental age of 9–7. Similarly, if another pupil had a mental age of 9 and an intelligence quotient of 80 when tested the first of January, his increase in chronological age would be four months. His new mental age, however, would be 9 years $+0.80\times4$ mo. or a little over 9–3

TABLE VIII. DISTRIBUTION OF 370 PUPILS BY MENTAL AGE AND AND GRADE AT THE TIME OF TESTING

Mental Age	Grade										
	IB	IA	IIB	IIA	IIIB	IIIA	IVB	IVA	VB	VA	Total
5–6 to 5–11	4										4
6–0 to 6–5	9	2	1								12
6–6 to 6–11	15		3								18
7–0 to 7–5	15	5	10	2							32
7–6 to 7–11	14	3	6	4	5	1					33
8–0 to 8–5	2	1	15	3	10	3	1				35
8–6 to 8–11		2	8	6	6	7	3	1	3		36
9–0 to 9–5			6	4	3	6	8	3	5		35
9–6 to 9–11		1	4	2	2	6	16	5	3	2	41
10–0 to 10–5					1	4	12	3	5	6	31
10–6 to 10–11					2	5	6	5	8	4	30
11–0 to 11–5							5	5	6	6	22
11–6 to 11–11						1	4	2	4	3	14
12–0 to 12–5							2	5	2	5	14
12–6 to 12–11						1	1		4	3	9
13–0 to 13–5									2		2
13–6 to 13–11											
14–0 to 14–5									1		1
Over 14–6								1			1
Total	59	14	53	21	29	34	58	30	43	29	370

Above normal: 48 pupils or 13 percent.
Normal: 210 pupils or 56.7 percent.
Below normal: 112 pupils or 30.2 percent.

TABLE IX. DISTRIBUTION OF 370 PUPILS BY MENTAL AGE AND GRADE AFTER CLASSIFICATION

Mental Age	Grade										
	IA	IIB	IIA	IIIB	IIIA	IVB	IVA	VB	VA	VIB	Total
6-0 to 6-5	7										7
6-6 to 6-11	11	1									12
7-0 to 7-5	16	9	1								26
7-6 to 7-11	16	3	7	5							31
8-0 to 8-5	12	2	7	6	1	2					30
8-6 to 8-11	2		16	10	8	5					41
9-0 to 9-5			4	3	7	10		3	2		29
9-6 to 9-11			3	2	5	9	5	5	2	1	32
10-0 to 10-5			5		2	9	14	6	4	2	42
10-6 to 10-11							14	3	5	6	28
11-0 to 11-5						1	10	10	6	6	33
11-6 to 11-11							1	8	7	3	19
12-0 to 12-5								1	11	5	17
12-6 to 12-11								2	3	4	9
13-0 to 13-5								1	1	7	9
13-6 to 13-11								1	1	1	3
14-0 to 14-5											
Over 14-6										2	2
Total	64	15	43	26	23	36	44	40	42	37	370

Above normal: 47 pupils or 12.7 percent.
Normal: 238 pupils or 64.3 percent.
Below normal: 85 pupils or 23 percent.

years. He would appear in the table with a mental age of 9–3. All this is based upon the assumption that the I. Q. remains constant. This is not absolutely true, but it is the best present working hypothesis for practical work.

According to Table IX, 12.7 percent are above their normal grade, 64.3 percent are in their normal grade, and 23 percent are below their normal grade. The comparison with Table VIII is shown in the following table and in Figure 1.

	Above Normal	Normal	Below Normal
First semester (Table VIII)	13.0	56.7	30.2
Second semester (Table IX)	12.7	64.3	23.0

It will be noticed that in Tables VIII and IX the percents of pupils above their normal grade are almost equal, Table IX showing a decrease of 0.3 percent. Small as it is, this difference is in the right direction. Table IX shows an increase of 7.6 percent of pupils normally placed, and a decrease of 7.2 percent of those below normal—in both respects an improvement over the percents of Table VIII.

Several reasons prevented a still greater improvement. In the first place, there are factors other than mental ages and intelligence quotients which must enter into the problem of promotion. In the second place, peculiarities in the conduct of the experiment operated to reduce the appearance of improvement. For example, it will be noticed that in Table IX most pupils who are classified as below normal are in the upper grades—i.e., from IVA to VIB inclusive. This is because at the beginning of the second semester, the pupils were put into grades according to their mental ages at the time they were tested, while Table IX was constructed according to their mental ages on the first of May. Suppose, for instance, that a child, tested the first of November, had at that time a mental age of 9–11 and an intelligence quotient of 125. His estimated mental age May first would then be 10–6, i.e., 9–11+ (1.25× 6 mo.). Nevertheless, he would have been placed at the beginning of the second semester in a grade according to his former mental age of 9–11. Clearly, this grade would be unduly low. This

element enters especially into the upper grades, since they were tested for the most part during the earlier months of the first semester. The reason for the retardation in grades IA and IIA is the fact that a number of pupils with high mental ages were retained in the special classes in these grades.

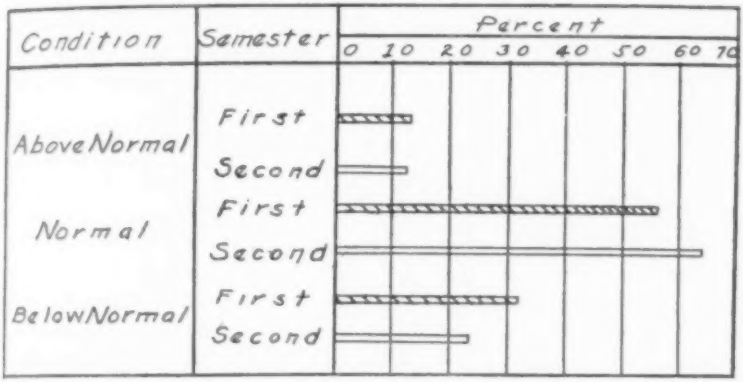

FIGURE 1. COMPARISON OF CONDITIONS IN THE FIRST SEMESTER AND IN THE SECOND SEMESTER

Twenty-five pupils were retained in the special classes in grades IA and IIA, although their mental ages were high enough to warrant more rapid promotion. The reason for retaining in the IA grade the first-grade pupils with high mental ages was that they must know how to read before being given rapid promotion to the higher grades. In the special IIA class the pupils are being given special training, part of it being IIIB work, so that although they appear in the tables as being retarded in the IIA grade, they are really doing more advanced work. In the IA grade it will be noted that there are 14 pupils classified in Table IX as too old mentally for that grade. Of these 14 pupils, 13 are in the special IA class. In the IIA grade it will be noted that 12 pupils are represented as too old for the grade. All of these pupils are in the special IIA class. If these 25 children were normally placed, the total would be 370 pupils distributed as follows: above normal 47, or 12.7 percent; normal 263, or 71 percent; below normal 60, or 16.2 percent.

This last distribution represents practically what has been achieved by the mental examinations and should therefore be compared with the original distributions given in Table VIII. The following table and Figure 2 give the comparison.

	Above Normal	Normal	Below Normal
Original distribution	13.0	56.7	30.2
Final distribution	12.7	71.0	16.2

This shows a shift of more than 14 percent towards the ideal and represents a large gain in the correct placement of pupils. Little improvement is noted in those above normal, because the school is naturally reluctant to demote pupils. A gain at this end of the distribution will come in time if the policy outlined in this article is adhered to. A great gain has been effected in those below their normal grade, cutting the number of misplacements practically in half. If the school pursues this method of classification systematically for several years, the amount of displacement will unquestionably be still further decreased.

General Remarks

The assistant superintendent of schools, after visiting the school, expressed himself as well pleased with the condition of the classes, especially with the uniformity of work being done in each room and the evenness with which the children accepted instruction and responded. He said that he considered it one of the best pieces of work accomplished in the city.

In speaking of the condition of the school in May, the principal declared that it was infinitely better than before the testing was done. She said that the teachers' attitude toward the children was greatly changed for the better. Formerly, a certain contempt had been felt for the dull child, but this had given way to an insight never present before and an infinite patience. She observed that the shifting according to mental ages had nearly eliminated the problem of discipline. Troublesome pupils had been of two kinds: either those for whom the work was too hard and who, finding they could not master it, turned their energy

into other channels; or those for whom the work was too easy and who, being bored, had sought more interesting activities. The shifting had practically eliminated the troublesome child by giving him work more suited to his ability. The principal said further that it had caused teachers to cooperate better with each other, and to exercise a keener insight into the individuality of pupils; that if pupils did not accomplish what their mentality indicated they ought to accomplish, the teachers were quicker to give them special attention in an effort to find out why they were not living up to their abilities.

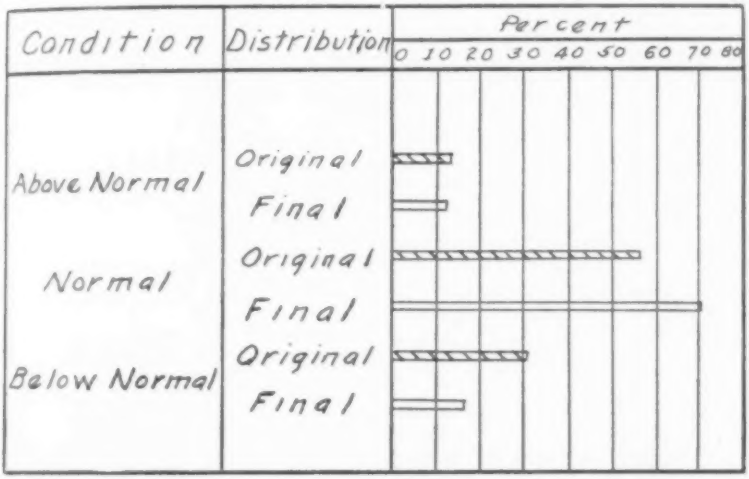

FIGURE 2. COMPARISON OF CONDITIONS IN THE FIRST SEMESTER (ORIGINAL DISTRIBUTION) WITH CONDITIONS ARISING WHEN CHILDREN IN SPECIAL CLASSES ARE REGARDED AS NORMALLY PLACED (FINAL DISTRIBUTION)

She considered the special classes a great success. She spoke especially of the work done in the individual class where each child received training suitable to his low mental age and intelligence quotient. It was her opinion that the children of this class would have derived almost no benefit from the regular grades, but that with individual training they were acquiring much practical education, especially along the lines of industry and hygiene.

The teacher of the special IIA class believed that without exception her pupils could easily have accomplished both the IIA and the IIIB grade work. She had given them some IIIB grade work and was planning to give them some more. They were quick to grasp principles and required little drill. She gave an example from their work in arithmetic. On a certain occasion they had been adding two-column numbers with success. Without warning she gave them four-column numbers to add. No pupil halted or asked a question, but all of them solved the examples correctly from their knowledge of two-column numbers. She also said that they read without difficulty a book which was used as supplementary reading in the fourth grade.

The tutoring teacher indicated that in her work with the pupils who had been given extra promotions, she had found but two who were not able to do the work expected from them. The principal, in speaking of these pupils, said that they were the only exceptions in the whole school; but that since they had been tutored only two months, they might yet do satisfactory work.

Summary

In this school efforts were made towards a classification of pupils according to mentality. A certain number were given extra promotion, and a few were demoted. A tutoring class, two classes for bright children, and an ungraded class were organized. All except two of the pupils who received extra promotion have justified their advancement. Conditions before and after these efforts were made have revealed a marked increase in the number of children in grades corresponding to their mental abilities.

Reports of the assistant superintendent, principal, and teachers all show great satisfaction. They stress the superiority of the school work accomplished, the splendid effect on discipline and the increased interest which the teachers show in the pupils.

The reclassification on the basis of mental age has justified itself in more ways than had been imagined before the experiment was begun. It is thoroughly practicable and will eliminate a great deal of the present-day waste and inefficiency in the ordinary school system.

USING STANDARDIZED TESTS IN RURAL SCHOOLS FOR GRADING PURPOSES[1]

SAMUEL S. BROOKS
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In my last article I explained how the cooperation of teachers was secured in the use of standarized tests and how the teachers were instructed as to the manner of giving and scoring them. The article concluded with an account of the distribution of the tests with directions that they were to be used at once in the schools. These schools, as I have indicated, were not graded. Indeed, it was the immediate purpose of this preliminary test to secure a satisfactory basis for grading them.

During the ten days allotted to the teachers for giving, scoring, and returning the tests, I visited as many schools as possible, giving advice and help where it appeared to be most needed. Considerable time and labor were thus saved in the later tabulation of results. Moreover, this plan enabled me afterwards to avoid much of the delay incident to the repetition of tests found on examination to have been carelessly or improperly given.

Even so, it was not all smooth sailing. In spite of preliminary precautions to insure accurate results in the shortest possible time, a number of tests had to be repeated before I could feel sure that the results were fairly accurate. The returns of two or three teachers indicated such gross carelessness or incompetence or both that I was obliged to repeat the tests in their schools myself. But since the purpose of this paper is to show how the results of these tests were used for grading purposes, I shall confine myself to that topic.

The first step was to mark each paper with the grade corresponding to the score recorded on it by the teacher. For instance one pupil's score on Woody's Multiplication Scale was 15. Since 15 is the standard score for grade VI, this paper was marked "VI." Another pupil's score on the same scale was 16. Since 15 is the standard score for grade VI and 17 is the standard score for grade VII, this paper was marked "VI½." On Courtis' Silent Reading

[1] This is the third article by Superintendent Brooks on the general topic "Putting Standardized Tests to Practical Use in Rural Schools."

Test a certain pupil received the following scores: words read per minute, 140; questions answered in five minutes, 38; index of comprehension, 94. The standard scores for grades II–VI are given as follows:

	II	III	IV	V	VI
Words per minute	84	113	145	168	191
Questions in five minutes	16	24	30	37	40
Index of comprehension	59	78	89	93	95

Hence the grades marked on the paper were, for words per minute, IV; for questions answered in five minutes, V⅓; for index of comprehension, V½.

If teachers are instructed to keep all the tests of one kind together rather than all the tests of one pupil this task of grading the papers is not interminable. As the teachers correct the papers they should mark the score plainly on the front page. Then the superintendent may compare these scores with the standard scores and grade the papers correspondingly. About two days sufficed to mark the approximately two thousand papers from all the schools. The work was considerably facilitated by having on a single sheet of cardboard the tables of standard scores for all the tests. Working at a large table with this sheet propped up in front of me, I could after a little practice ascertain at a glance the grade corresponding to any score. The advantage of such a procedure will soon become obvious to any one who attempts to mark a large number of papers with the standard scores scattered in a dozen different books and pamphlets. (By way of an aside, I wonder why all the authors of tests do not print the standard scores on the front page. It would save a lot of time for the people who use the tests.)

Next came the harder task of devising a method of recording results which would meet four conditions: (1) be in a form readily available for grading purposes; (2) be concrete and graphic enough to be clearly understood by teachers, pupils, and parents; (3) show on a single form small enough to be conveniently filed the standing of a pupil, a class, or a school in all subjects of the course of study for which standardized tests are available; (4) be in a form that could be used as the beginning of a continuous record to measure progress of pupils and ability of teachers.

The class record sheets and graph sheets accompanying several of the tests were carefully studied with a view to adapting them to the purpose in hand. I soon decided, however, that they were too complicated and time-consuming for practical use by the rural superintendent who must do all his own tabulating of results or have it done by untrained teachers. Certainly such record and graph sheets would not meet any of the last three conditions mentioned above. They could not be easily understood by pupils and parents. There would be as many sheets as there were subjects; and several files instead of one would therefore be required. Furthermore, such sheets do not accompany all the tests, and only two or three tests make any provision for keeping permanent records of the scores of individual pupils. Some sort of simple graphic representation that would include all the tests on a single small sheet was absolutely necessary if the scheme was to be simple enough for practical use.

After considerable experimenting during which some of the graphs evolved resembled nothing so much as a lost trail in the desert, I finally adopted the following plan as both simple and practical. I ruled several 5×8 cards in copying ink with vertical and horizontal lines as shown in Figure 1. The vertical lines were numbered at the top to represent subjects and phases of subjects in which tests had been given. The horizontal lines were numbered with Roman numerals to represent the eight grades of the elementary school. From these originals nearly four hundred hektograph copies were made—enough for all the pupils in my schools above the first grade.

With these forms in hand and with the papers properly graded it did not take very long to construct a graph for each individual pupil. Figure 1 is a copy of an actual record on file in my office. It is the graph of L. D., an 11-year-old boy in the village school, Tamworth, N. H. Table I shows the same data including the subjects and phases of subjects corresponding to the numbers of the vertical lines of Figure 1. L. D.'s grade for each test is shown in Table I in the right-hand column opposite the name of the test. In constructing the graph a heavy dot was placed at the intersection of vertical line no. 1 with grade line no. III to indicate third-grade ability in rate of silent reading; another dot at the intersection of vertical line no. 2 with grade

TABLE I. RECORD OF L. D.

(See also Figure 1)

No.	Subjects and Phases of Subjects	Grade
1	Rate of silent reading: Courtis' Test	III
2	Writing speed	VII
3	Writing quality	III
4	Questions answered in five minutes: Courtis' Test	VII
5	Index of comprehension: Courtis' Test	VII
6	Spelling	III
7	Addition	IV
8	Subtraction	V
9	Multiplication	V½
10	Division	VI
11	Mixed fundamentals	V
12	Arithmetical reasoning: correct principle	IV
13	Arithmetical reasoning: correct answer	IV
14	Visual vocabulary	VI
15	English organization	V
16	Geography	IV½
17	History	V

line no. VII to indicate seventh-grade ability in number of questions answered in five minutes; another at the intersection of vertical line no. 3 with grade line no. III to indicate third-grade ability according to index of comprehension; and so on until the pupil's standing in all the subjects had been properly located by dots. The dots were then connected by a heavy line giving the graph as shown. In actual practice the grades marked on the papers were translated directly into properly placed dots on the graph card without constructing tables like Table I. This can be done very rapidly with a little practice. Of course for this purpose the papers should be sorted so as to get all the test papers of one child together. By this means each pupil's graph can be completed before taking up the next.

The order in which the subjects are entered on the graph card is significant. Reading is placed first because all grades are

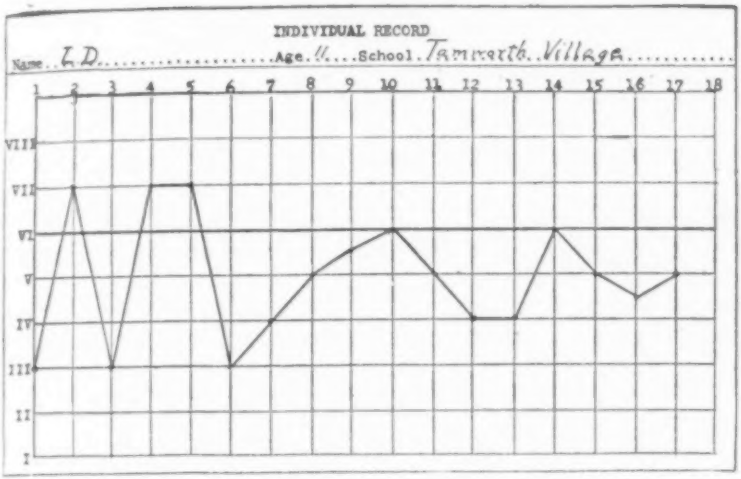

FIGURE 1. SAMPLE OF INDIVIDUAL RECORD. DATA THE SAME AS IN TABLE I

tested for reading ability. Spelling and writing follow since they come early in school life. Then come the four fundamental operations of arithmetic, and so on, those subjects coming last which are taught only in the upper grades. Suppose the subjects were given in the following order: reading, history, spelling, arithmetical reasoning, addition, geography, etc. Then the graph of a third-grade pupil could not be drawn since such a pupil would not be tested for history, geography, or arithmetical reasoning. The dots on the graph card indicating his grade of ability in the subjects which he does take would not be located on consecutive vertical lines. Hence no continuous line connecting the dots could be drawn. With the subjects arranged on the card in the order shown the graph will be complete as far as it goes although it may extend only part way across the card.

Using numbers to represent the subjects on the graph card is not such a disadvantage as it might at first appear to be. One very soon learns to associate the subjects with their respective numbers. The slight disadvantage experienced in the beginning is very much more than offset by the advantage of being able

to use a much smaller card than would be possible if the names of all the subjects were written in.

Next came the problem of deciding upon the grade in which pupils should be placed for the year's work. A glance at the graph for L. D. shows that he had an average of about fifth-grade ability at the beginning of the school year. In fact the average of his grade as shown in Table I is almost exactly five. Clearly then, since the standards are June standards, he belongs in the sixth grade for the current year. Therefore the sixth-grade line on his card was emphasized by overlining to indicate that he is a sixth-grade pupil. Then, with his name, age, and the name of the school entered as shown in Figure 1, the card was ready for filing. In the same manner a graph card was prepared for each child, his grade determined, and the card placed on file.

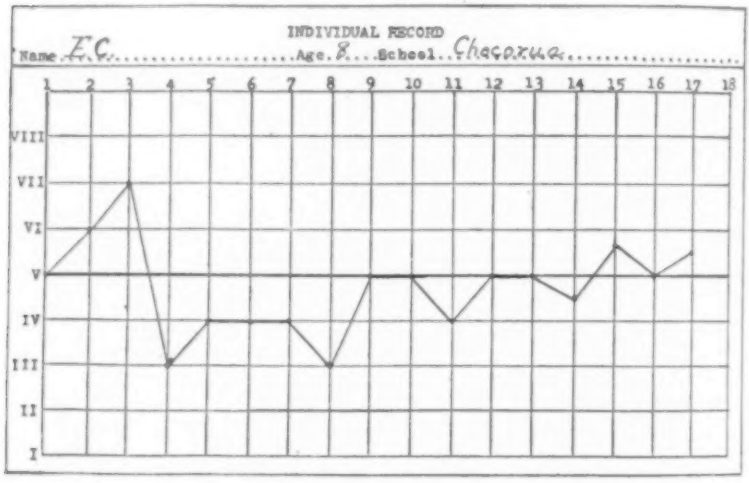

FIGURE 2. SAMPLE OF INDIVIDUAL RECORD OF A BRIGHT CHILD (E. C.)

Within two weeks from the time the first tests were returned a graph card had been filed for every pupil (above the first grade) in the district, and each pupil had been assigned to the grade corresponding to the average ability indicated by his or her graph. A week later each teacher had received copies of

the graphs of her own pupils in order that she might see where their weak points were and govern her work accordingly.

Although in about a score of cases it was later found advisable to place a child a grade above or below that indicated by his graph, on the whole this method of grading has proved surprisingly accurate. Most of the cases referred to were those of very bright children who, on the basis of the test results, would have been advanced to a grade very much above normal for their ages. The graph in Figure 2 illustrates a case in point. This eight-year-old girl shows an average of fifth-grade ability. Her mental age as indicated by the Otis Group Intelligence Scale is twelve years. She is fully capable of doing sixth-grade work this year. However, in spite of the opinions of some eminent educators to the contrary, I cannot convince myself that it is wise to rush such children through school especially in a district like this where the elementary school is pretty sure to see the beginning and end of their school life. Is it not better to keep them in school until they are at least fourteen, giving them a chance to do more and harder work than their classmates of mediocre ability, and supplying them with much carefully selected informational supplementary reading to broaden their minds? There were four other cases of this kind in the same school.

This completes the account of how I used standardized tests and scales to solve my grading problem. I believe that anyone confronted with a similar problem will find the scheme practical. Nor will the labor involved prove either monotonous or uninteresting to him whose heart is in his work.

THE SPLIT-UNIT PROGRAM IN HIGH SCHOOLS[1]

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The term "split-unit" is used in this paper to designate a subject of study which is pursued for fewer than five class periods a week throughout a school year. One form of the split-unit already is quite familiar and conventional. For example, botany, physiology, trigonometry, solid geometry, and astronomy frequently have been allotted only a half year instead of a year in the program of studies. Courses in these subjects have been known as half-unit courses. The ready acceptance which such courses have received seems to be due to the opinion that certain subjects have a content of information which may be imparted to a student in a half year. When this information is mastered, the subject is said to be finished. Doubtless most of us in the archives of our memory have records of achievement in the domain of finished knowledge. At times we thrill with pride when some chance event unlocks the treasure house and gives us a view of the past. These pleasures of memory seem to be the sole reward and perhaps also the justification of much of our effort. "Forsan et haec olim meminisse juvabit."

The limits set for this paper do not permit a discussion of the value of "finished subjects." Such a discussion would involve consideration of the whole question of functional education. In this respect, then, the split-unit program merely raises a fundamental issue which cannot be settled at this time.

Of more immediate concern is the necessity of reaching an understanding with regard to the time allotment of the various subjects in the high-school program of studies. If pupils had unlimited class periods to dispose of, it might be well to require that they devote to each major subject five periods a week throughout the year. It would then be necessary to decide which subjects are major and which are minor. Is physical education a major subject or a minor subject? Is citizenship a major subject or a minor subject? Shall Latin have as much time in

[1] An address before the High School and College Section of the Southern Wisconsin Teachers' Association at Madison on March 26, 1920.

the program as drawing, or shall it have more? A mere statement of these questions shows the difficulties which the high schools are forced to meet when they attempt to depart from traditional procedure.

And yet they have departed from this procedure in some important particulars. Music, for example, in many high schools is allotted one period a week throughout the four years. Drawing likewise is allotted one or two periods a week for one or more years. Both of these illustrate the use of the split-unit in the program. Music and drawing are supposed to be of sufficient importance to justify a requirement that all pupils shall study them even if the schedule already is crowded.

The situation with respect to music presents very clearly one phase of the split-unit program. In many schools it is customary to devote to choral music one or two periods a week throughout one or more years, frequently through the four years. Why does not some one demand that all instruction in choral music be concentrated in a year or a half-year with five periods a week devoted to it and that the subject be finished and something else "taken up" in its place? The answer to this question is simple. Most teachers think that choral music should occupy the attention of the pupil throughout his entire school career; that it is not a subject which can be "finished"; and that any attempt to concentrate upon it for the purpose of eliminating it sooner would be a serious mistake. Contact with the subject over a long period of time instead of concentration upon it for a short period is the desideratum in the case of music. In the terms of the psychological laboratory, diffusion is deemed preferable to concentration.

On the other hand there are certain forms of motor-learning where concentration appears to be productive of the more valuable results. Laboratory experiments in learning speed in the use of the typewriter, for example, point to the advantage of concentration. Up to this time, however, the experiments to determine the relative values of concentration and of diffusion have not been sufficiently extensive nor have the results been sufficiently clear to warrant any final deductions.

Until scientific experimentation demonstrates beyond a doubt the value of concentration or of diffusion in each of the subjects,

we must be guided in our practice largely by theoretical considerations. Take, for example, such a subject as citizenship, which properly claims now more strongly than ever before an important place in the program of studies. If it were possible at present to teach this new subject five periods a week throughout the four years, we still should not give to it more attention than it deserves. Without extensive modifications of the curriculum, however, such a program is not possible. What shall we do then? To ignore the subject altogether would be acceptable to no one. It remains, then, either to concentrate on one or two short courses in the hope of finishing the subject or to apply the principle of diffusion by devoting a lesser amount of time each week to the class exercises and by continuing the instruction over a longer period. Theoretical considerations weigh heavily in favor of diffusion. Good citizenship, such as we wish to teach in the schools, is not something to be acquired once for all and then packed away among the things to which we need no longer to give our attention. Good citizenship is a growth, an acquisition which becomes ours only by slow degrees at the cost of long-continued effort. Until the teaching of citizenship can have a place in the schedule of every student every day for the four years of his high-school course, let us give it such attention as is possible by using the split-unit program.

Those who are opposed to this type of program-making attempt to support their contentions by referring to the experience of Canada. According to their statements, the split-unit has been tried in Canada, has proved a failure, and is now abandoned. The answer to this contention is that Canada is a large country made up of several large provinces; that the educational practice in the several provinces is not uniform; and that in at least one of the most important of these provinces, Ontario, the split-unit program has not been abandoned and there is no assurance that it will be. Moreover, even if Canada had abandoned this type of program, that fact would prove nothing concerning the statements in this paper, for the Canadian practice had gone far beyond anything that is advocated here.

A unit is a standard which the colleges have set up as an objective for high-school students to attain. It is measured in terms of subject-matter studied by the members of a class for

five periods a week for at least thirty-six weeks. At the time when the definition of a unit was formulated, class periods were quite generally forty-five minutes in length. Increasing numbers of high schools now are lengthening the class period to sixty minutes. Would four sixty-minute periods, in algebra for example, be just as valuable in a student's program as five forty-five minute periods? Would four sixty-minute periods be a split-unit or a full unit? No positive answer can be given to these questions until further experimentation affords the data upon which positive conclusions can be based. Here is a promising field for the scientific investigator.

It is important to note, however, that the definition of the standard-unit stresses the time element rather than the amount of mastery which a student may have over subject-matter. This kind of unit takes but little cognizance of the quality of work which the student performs. It merely sets a minimum standard below which no one who wishes credit for entrance to college may fall. This unit, then, is a mechanical device whereby the colleges assure themselves that their entering students have been in contact with certain subject-matter for a fixed period of time and that those students have fulfilled the minimum requirements of their teachers in that subject-matter. This mechanical device is a great aid to colleges which admit students upon certificate rather than upon examination. Perhaps no more complicated system would be acceptable. We know, however, that some colleges are not altogether satisfied with the unit system. Some of them, for example, require all students to take an entrance examination in English composition. Without regard to the units of credit which a student may submit, he is conditioned in English composition unless he can pass the entrance examination.

If there is any inherent sacredness in the standard-unit, one cannot but ask why the colleges do not organize all of their courses upon the five-hour-a-week basis. It is a matter of common knowledge that large numbers of college courses occupy only three hours a week; that some occupy only two hours; and that a few are only one-hour courses. If the colleges find it convenient and advantageous to exercise discretion in making the time allotments for the various studies, it is not at all unreasonable to suppose that a similar exercise of discretion would be to the advantage of the high schools.

In our American high schools the split-unit program has not been adopted for the purpose of destroying the standard unit. The split-unit has been the only device open to those administrators who wished to give a place to some of the so-called newer subjects. For these subjects it usually has been the split-unit plan or nothing. However, if objections raised by the colleges to a split-unit program should lead to a re-examination of the significance and of the value of the standard unit for the purpose of bringing it into harmony with the progress which the high schools are making, the result would be clear gain and would justify the courage which some high-school administrators have shown. In the meantime it is not too much to hope that our experimental psychologists will give us further help in the problem of program-making.

COMMON SCHOOL FINANCE IN COLORADO AND CERTAIN INFERENCES OF NATIONAL IMPORT *(Concluded)*

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University of Minnesota

DISBURSEMENT OF REVENUES

The income of the public school fund, technically known as "the public school income fund," is apportioned semi-annually (in July and January) by the superintendent of public instruction among the counties in proportion to the school population as reported for the next preceding year.[63]

The general county school fund, as explained above (page 659) includes all moneys paid into the county treasury derived from: (1) the national forest reserve fund; (2) public school income fund; (3) general and special county school taxes; (4) sales of lost goods and estrays; (5) fines. This general fund is apportioned quarterly in January, April, July, and October by the county superintendent. "He may apportion the same at other times if there be sufficient money in the treasury to require it."[64] This general county school fund is apportioned among the districts upon the same basis (school census, 6 to 21 years[65]) as that upon which the income of the public school fund is apportioned among the counties.[64] The general fund by apportionment disbursed to the counties in the year 1914–1915 totaled $386,293.87 and in the year 1915–1916, $475,482.19.[66]

LAWFUL AND FORBIDDEN USES

Public school fund.—Subject to the provision in the Constitution (articles V and IX) which forbids using public moneys for private or sectarian institutions, the major portion of the public school income fund is distributed without assigning any definite objects upon which it must be expended. The expenditure of

[63] *Colorado school laws, annotated*, 1917, p. 155, sec. 312.

[64] *Ibid.*, p. 54, sec. 105. [65] *Ibid.*, p. 144, sec. 285.

[66] Computed from data in *Colorado state auditor's report*, 1915–1916, p. 43, by subtracting from the sum total of the annual apportionment the apportionment to the secretary of the State Teachers College and the Gunnison Normal School.

certain quotas of it, however, are defined by law. These include: (1) money to provide for the cost of furnishing school officials and teachers with blanks and report books;[67] (2) a sum not to exceed $150,000 (1919) to be set aside out of the income of the public school fund as a minimum wage for teachers fund to aid districts unable to pay the minimum legal wage.[68]

The state board of land commissioners is authorized to deduct not more than 10 percent from the receipts of mineral rents and royalties to pay the expenses of administering school lands.[69] These rentals would otherwise be added to the invested principal of the fund. Hence they are excluded from our discussion of the uses of the public school fund income.

General fund by apportionment.—The public school income fund, together with the other funds which go to make up the general fund by apportionment, may be used by districts for any objects whatsoever except:

> For building, furnishing or erecting additions to any school house, or for the purchase or improvement of any school house, site or lot; Provided, That if any portion of the aforesaid school fund remains to the credit of any district after the payment of all expenses necessary to the support of a public school for a period of ten months in any one year, in said district, it shall be lawful for the district board to use such balance for any of the purposes, provided for in section 51 of this chapter.[70]

County funds.—The moneys derived from the county general school tax can be used for teachers' wages only.[71] The law forbids that moneys received from the general fund by apportionment shall be used for building purposes.[70] The legislature of 1919 enacted a law establishing an annual salary scale for county superintendents and providing that they be paid from the general fund.[72]

District revenues.—The question, to what uses may money derived from district sources be lawfully put, has been largely answered by the paragraphs setting forth the objects for which

[67] *Colorado school laws, annotated*, 1917, p. 153, sec. 310; p. 154, sec. 312.
[68] *Colorado educational laws*, 1919, pp. 35–36, secs. 1–3; for further discussion see below, pp. 751–52.
[69] *Colorado school laws, annotated*, 1917, p. 106, sec. 187.
[70] *Ibid.*, pp. 106–7, sec. 188. [71] *Ibid.*, p. 162, sec. 331.
[72] *Colorado educational laws*, 1919, p. 20, sec. 13. The scale for superintendent's annual salary is as follows: two counties of Class I (Division A), $3,000; 4 counties of Class I (Division B), $2,800; 6 counties of Class II, $2,000; 20 counties of Class III, $1,500; 19 counties of Class IV, $1,100; 8 counties of Class V, $900; 2 counties of Class VI, $500; 2 counties of Class VII, $100.

districts may tax themselves. The largest single item of expense in every school system is teachers' salaries. We have seen how the county restricts the use of the proceeds of the county general school tax to this single object. This policy is continued by the districts with certain limitations. The law seeks to provide as completely and effectively as possible for the legal minimum teacher's wage. In advance of the day designated for levying the special school tax it requires the school board of each district to certify to the county commissioners that part of the special tax (not exceeding ten mills) which, with all other apportionments from the county and state, shall be sufficient to pay the legal minimum wage to each teacher in the district for not less than six months. " . . . Such part of the special tax levy shall be made by the county commissioners and used for the purpose of paying teachers' salaries only."[72]

Kindergartens.—As long ago as 1893 Colorado empowered district boards to establish and maintain free kindergartens as a part of the public school system and provided that such kindergartens should be supported by the district special school fund.[73]

Requirements for Participation

When grants from the state are made to depend upon the fulfillment of certain requirements, it is possible to use such state funds to insure the lawful use of school moneys, the securing of school reports, the enforcement of certain provisions, and the maintaining of definite standards. Policy varies in the United States all the way from "no requirements for participation" in such states as Alabama, Georgia, Iowa, and Tennessee, to a long list of requirements in such states as Massachusetts, Michigan, and Minnesota.

Colorado has thus far made little attempt to use the income of her permanent public school fund, the general fund by apportionment, or any other income fund as a leverage for enforcing school laws or elevating school standards. Instead of imposing upon school districts penalties in the form of forfeitures of quotas of state aid as Massachusetts does with her towns, Colorado places the responsibility and penalty upon the officer to whom the law has delegated the execution of the act or rule. The officer who

[72] *Colorado session laws*, 1893, p. 436, sec. 1; *Colorado revised statues*, 1908, pp. 1396–97, sec. 5927; *Colorado school laws, annotated*, 1917, p. 132, sec. 257.

fails in his duty to see that the provisions of the laws are complied with "shall be removed from office and the vacancy filled as in other cases."[74] If the district census is not furnished to the county superintendent, the secretary of the district board forfeits $100 and must make good any loss suffered by the district. Again, "the person or persons through whose neglect or refusal the failure so to levy (the county school tax) shall occur, shall forfeit the sum of one hundred ($100) dollars each and be liable for all damages resulting from such failure."[75]

Only one condition is definitely provided in the laws, which must be met by a district in order to receive its share of the school fund, namely, the maintenance of "a public school at least three months of the school year."[76] This minimum term of three months is practically of little importance at the present time. The law providing a minimum wage for teachers provides special aid for all school districts unable to support a school at least six months.[77] For this and other reasons the number of districts maintaining a school less than six months (120 days) constitutes an almost negligible minority.[78] A study of the 52 county superintendents' reports for the year 1915 received by the superintendent of public instruction showed only 62 districts maintaining school less than 120 days.[79]

Not as a result of legal provisions, but from the very nature of the case, any district wishing to participate in the general fund by apportionment must furnish the county superintendent with a statement of the school census. The furnishing of this school census thus becomes a condition of participation in the fund although as already pointed out it is the secretary of the board who is penalized for such a failure.

Inequalities of School Burdens and Public Aid

Purposes of public school aid.—There are two fundamental reasons why the state should possess general school revenues with which to aid the individual constituent school communities: (1) in order to insure to every child in the state the opportunity

[74] *Colorado revised statutes*, 1908, p. 1416, sec. 6012.
[75] *Ibid.*, p. 1399, sec. 5936; p. 1386, sec. 5894. [76] *Ibid.*, p. 1385, sec. 5891.
[77] *Colorado school laws, annotated*, 1917, p. 168, sec. 340.
[78] "A school month shall be 4 weeks, a school week 5 days." *Colorado revised statutes*, 1908, p. 1416, sec. 6013.
[79] *Report of the Colorado school system*, p. 57.

of going to school; (2) to make such opportunities as far as possible equal. Equality of educational opportunity for all the children of the entire state is a brief but correct statement of the aim underlying general, that is, state and county aid. Equality implies much more than universal education and state-wide equality in the length of the school year. It means equality of conditions under which children study and play. It means trained teachers, and healthful, well-equipped, inviting school houses and yards, equality in the scope, vitality, and richness of studies. The only possibility of approaching equality in this broad sense lies partly in proper organization and administration of school units and partly in equality of school support. Equality in school support means equal distribution of economic responsibility and economic power. Such economic equality can come only if the amount of aid granted to the school unit (in Colorado, the district) is determined on the basis of the ability (i.e., the financial resources) and the effort of this unit. Data concerning enrollment and school attendance given in an opening paragraph reveal strikingly the inequality of educational opportunity. How far Colorado is from succeeding in her efforts in this direction is shown by the Table VIII.

In order to show the inequality of conditions between counties, the counties ranking lowest and highest have been chosen in each case with intervening counties representing as nearly as possible equal gradations of variation. In two cases, only 60 of the 63 counties furnished data, in a third case only 61 and in a fourth case only 62. On this account it was impossible to select the same numerical ranks for each group of data.

From Table VIII it is seen that the proportion of children not enrolled in school during eight years from 1906 to 1913 varied all the way from 7 to 59 percent; the school year from 98 to 167 days; teachers' average monthly salary from $39 to $81; and expenditure per child from $21 to $77. The fact that Items I, II, and III represent an eight-year average greatly increases their significance. In connection with Item IV it may be noted that whereas for the entire state the *average* expenditure per child in attendance in 1914–1915 was $60.43, the *median* expenditure per child in attendance in the same year—represented by Moffat County—was only $40.42. On the basis of the average for the entire state

TABLE VIII. INEQUALITIES OF EDUCATIONAL OPPORTUNITY AMONG COUNTIES

ITEM I. ENROLLMENT				ITEM II. SCHOOL YEAR		
County		Children Not Enrolled(b)		County		Length of Year in Days(d)
Rank(a)	Name	Per-cent	No.	Rank(c)	Name	
1	Sedgwick	7	46	1	Crowley	167
12	Kiowa	16	117	15	Cheyenne	151
34	El Paso	22	483	31.5(e)	Douglas	141
48	Elbert	27	455		Jackson	141
60	Baca	41	278		Las Animas	141
					Pueblo	141
				45	Montezuma	133
				61	Baca	98

ITEM III. TEACHERS' SALARIES			ITEM IV. EXPENDITURE PER CHILD		
County		Teachers' Average Monthly Salary(f)	County		Annual Expenditure per Child Enrolled(h)
Rank(a)	Name		Rank(g)	Name	
1	Gilpin	$81.00	1	San Juan	$77.31
15	Otero	64.50	16	San Miguel	50.45
28	Bent	59.00	31	Moffat	40.42
45	Kiowa	53.50	46	Routt	33.65
60	Washington	39.00	62	Costilla	21.39

a Based on reports of 60 counties. Ranks computed. An eight-year average 1906–1913.
b Sargent, C. G. *Rural and village schools of Colorado*, p. 14, table 2. Percents computed.
c Based on reports of 61 counties. Ranks computed. An eight-year average 1906–1913.
d *Ibid.*, p. 44, table 9. e Four counties fall in the same rank with the same length of term in days.
f *Ibid.*, p. 56, table 13.
g Based on reports of 62 counties. Ranks computed. Figures for 1914–1915.
h *Report of the Colorado school system*, p. 60, table 34.

Colorado ranked ninth in the Union. On the basis of the median county her expenditure corresponded approximately to that of Illinois—a state which with an average expenditure in 1914–1915 of $40.53 per capita of attendance ranked twenty-eighth in the Union.[80]

It would be illuminating to compare the counties in Colorado, as to each of the items included in Table VIII, with states which most closely approximate the conditions existing within the county. As space will not permit such a comparison, it has

[80] *United States commissioner of education report*, 1917, 2:55, table 16.

seemed best to select the average expenditure per child in attendance. Table IX presents the annual average expenditure for certain selected counties and the annual average expenditure in the state most closely approximating that of the county. By noting the rank of the state, we may discover how many states in the Union spend more and how many less than the county in question. We also discover that there are counties in Colorado (than which state there are only nineteen richer in the Union) which from the standpoint of annual expenditure per child must be ranked with such states as Missouri.

TABLE IX. COUNTIES IN COLORADO COMPARED WITH CERTAIN STATES AS TO AVERAGE ANNUAL EXPENDITURE PER CHILD IN ATTENDANCE, 1914–1915

COUNTY[a]			STATE[b]		
Name	Rank in State[c]	Amount	Name	Rank in United States[d]	Amount
San Juan	2	$101.06	Montana	1	$81.68
Crowley	16	68.96	North Dakota	6	69.62
Ouray	31	56.27	Wyoming	12	56.45
Otero	46	49.76	Pennsylvania	17	49.82
Costilla	61	35.36	Missouri	31	37.30

a Report of the Colorado school system, p. 60, table 34.
b United States commissioner of education report, 1917, 2:55, table 16.
c Reports for 61 counties—seven of which are given with the following footnotes: "Data on this item (average cost per pupil, 1914–1915; cost based on average daily attendance) given in reports from these counties are so incomplete that absolute accuracy is not possible." Baca County with an amount of $118.06 ranks first and is omitted here as it is doubtless erroneous. Ranks computed.
d Ranks computed.

Such conditions as those revealed by the above table, which were brought to light by the surveys of Sargent and Monahan and Cook, and which still continue, leave no doubt of the need for radical reform. Sargent wrote several years ago: "The more carefully the subject is studied and the more thorough the investigation, the worse conditions are found to be." These surveys and more recent data show beyond dispute that thousands of children of school age in the state are out of school every day, and that thousands of those who attend are housed in miserable buildings, and are taught by teachers who are under-paid, ignorant, and either untrained or ill-trained for their work.[81]

[81] SARGENT, C. G. *Rural and village schools of Colorado*, pp. 5, 14–15, 22, 65–81.

Primary need not more school money.—The cause of these conditions is not to be found primarily in the lack of adequate school moneys. Colorado undoubtedly needs more money for her schools, as does every state in the Union. But more necesarry than increased revenues is a complete reform in the organization of her school system, particularly the abolishment of the present district system, and a complete reform in the methods of school support. Before undertaking to suggest financial reforms needed, let us consider somewhat further than has been done the inequalities among counties and among districts resulting from present methods.

Inequalities of county school burdens.—Monahan writes: "State funds are supposed to equalize the burden of education among the various counties, some of which have low valuation and a large school population, and even with high taxes have difficulty in raising enough money to support good schools."[82] The amount of state aid granted to a county or to a district should depend, therefore, upon two things: (1) the unit's potential ability to aid itself as expressed in its assessed valuation per school child; (2) the degree of effort made by the unit (county or district) to aid itself as measured by the ratio between its local tax and its valuation.

TABLE X. INEQUALITIES OF COUNTY SCHOOL FINANCE IN COLORADO AS SHOWN BY VARIATION AMONG SIXTY-THREE COUNTIES, 1914–1915

	Lowest	Median	Highest
Valuation of county per school child(*a*)	$1,822 (Baca)	$5,615 (Pitkin)	$22,674 (Park)
County school tax in mills(*b*)	0.40 (Delta)	1.00 (Alamosa)	3.75 (Mineral)
Received from state fund			
Per child in average daily attendance(*c*)	$2.76 (Las Animas)	$3.67 (Gilpin)	$6.46 (Washington)
Per teacher employed(*c*)	$27.00 (Park)	$65.00 (Alamosa)	$121.00 (Conejos)
Proportion total school support received from:			
State(*d*)	3% (Park)	.....	16% (Conejos)
County(*d*)	5% (Delta)	.....	49% (Denver)
District(*d*)	45% (Denver)	.....	87% (Delta)

a Report of the Colorado school system, p. 37. *b Ibid.*, p. 43. *c Ibid.*, p. 38. *d Ibid.*, pp. 35–36.

[82] *Report of the Colorado school system*, p. 36.

The unfairness of the school situation and the injustice attending the present division between the various counties of the burdens of school support become evident when we consider inequalities in valuation, in school tax levied, and in amount of state aid received. Table X presents these inequalities by indicating the lowest, median, and highest datum in each case.

The chief purpose of Table X is to show how widely counties vary in their potential ability to finance their schools, in their educational efforts and zeal, and in the amount of aid they receive from the state. Table XI aims to show to what extent Colorado's present methods of school finance establish a balance between these three factors—valuation, county tax, and state aid.

TABLE XI. A COMPARISON OF THE FINANCIAL ABILITY AND SCHOOL BURDENS OF CERTAIN SELECTED COUNTIES IN COLORADO, 1914–1915

County	Valuation of County Per School Child (6–21)(a)		General County School Tax in Mills (County High-School Tax Included)(b)	Received from State Fund		Percent of Total School Support Received from:(c)		
	Amount	Rank		Per Child in Average Daily Attendance(a)	Per Teacher Employed(a)	State	County	District
Bent	$ 1,822	1	2.00	.....(d)	$49	12	27	61
Washington	3,516	8	1.25	$6.46	40	14	9	87
Larimer	4,450	16	1.10	3.51	81	8	19	73
Alamosa	5,057	24	1.00	3.66	65	6	15	79
Hypothetical median	.....	.....	1.00(e)	3.67(e)	65(e)	7.3(e)	17(e)	76.2(e)
Pitkin	5,615	32(f)	1.50	3.38	72	5	19	76
El Paso	6,003	40	1.74	3.65	78	5	27	68
Eagle	7,291	49	0.60	3.80	43	6	12	82
Cheyenne	9,542	56	1.66	3.07	30	4	17	79
Park	22,674	63	0.80	3.61	27	3	31	66

a *Report of the Colorado school system*, p. 37, table 15.
b *Ibid.*, p. 43, table 23. c *Ibid.*, pp. 35–36, table 14.
d Data omitted as unavailable. See p. 38 of *ibid.* e Computed.
Median in valuation as will be evident from rank.

From Table XI we see that Park County, whose valuation per school child is over $22,000, receives more state aid per child in average attendance than Cheyenne, Pitkin, or Larimer counties, each of which has a far lower valuation and whose local tax is higher. Again, Park County which is approximately four times as rich as Pitkin County levies a county tax only eight-fifteenths as great and whereas Park County received from the state $3.61 per child, Pitkin receives only $3.38. It is unnecessary to point out further the inequality in school financial burdens, aid, and effort

revealed by Table XI. Attention should be called, however, to the fact that the poorest of all, Baca County, levies the highest county tax, and that of the counties selected, four (Alamosa, Pitkin, El Paso, and Larimer) received much larger quotas from the state per teacher employed.

Inequalities in district support.—The inequalities resulting from Colorado's present system of school support are even more evident when we compare district with district than when we compare county with county as will be seen from Table XII.

TABLE XII. A COMPARISON OF FINANCIAL ABILITY AND DISTRIBUTION OF SCHOOL BURDENS IN TWO COUNTIES (CONEJOS AND OTERO) OF COLORADO, 1914–1915

County and District	Rank in Valuation	Valuation of District Per Census Child(a)	Received from State Funds		District Tax in Mills(c)	Percent of Total School Support Received from:(d)		
			Per Child in Average Daily Attendance(b)	Per Teacher Employed(b)		State	County	District
Conejos County (27 districts)(e)								
29	1	$ 61"	$9.24	$171	7.00	21	35	44
26	7	1,234	5.65	181	1.06	26	47	27
Median(h)	.....	2,072	3.49	93	3.20	15	24.3	61.3
14(f)	14	2,072	4.38	98	3.07	14	24	62
16	21	6,117	2.93	32	2.02	9	16	75
15	27	26,545	3.69	59	0.68	7	12	81
Otero County (22 districts)(e)								
11	1	3,374	3.08	68	6.5	5	10	85
29	6	5,752	2.42	81	2.1	2	4	94
23(i)	11(i)	7,475	5.32	60	2.7	6	11	83
Median(i)	.....	7,792(g)	2.95	65.50	2.55	7.1	12.5	81.5
9(i)	12	8,109	2.91	77	2.7	7	14	79
20	17	10,227	2.98	67	2.6	7	13	80
13	22	21,544	3.08	64	2.0	5	9	86

a Report of the Colorado school system, p. 39, table 18. *b Ibid.*, p. 40, table 20.
c Ibid., p. 42, table 22. *d Ibid.*, p. 41, table 21.
e The numbers by which the districts are named exceed the number of districts reported, e.g. in Otero County where 22 districts are reported, the sixth in rank in District 29.
f Median in valuation as will be evident from rank.
g A hypothetical district included to indicate median valuation.
h Computed. *i* The median lies between these two districts, 22 and 9.

From Table XII it is evident that Conejos County, District No. 12, whose valuation per census child is just half that of District No. 26, taxes itself nearly seven times as much, yet receives 5 percent less aid from the state, 12 percent less from the county, and 17 percent more from the district. District No. 15, whose valuation per census child is more than four times that of District No. 16, receives from the state $0.76 more per child in attendance

and $27 more per teacher employed. District 16 levies a tax of 2.02 mills, whereas District 15 levies a tax of only 0.68 mill, yet so much greater is the latter's valuation that she derives 6 percent more of her total school moneys from her district fund than does District No. 16. Similar conditions are revealed when we consider Otero County, as will be seen readily by comparing District No. 29 with 23, or 23 with 9, or 20 with 13. Tables XI and XII reveal in a striking manner not only the wide variation between counties and between districts within the same county with respect to valuation per census child but also how defective is the present system of school support. From this brief description of the inequalities of educational opportunity, school burdens, and school aid, we may now turn to consider the efforts Colorado has made to reduce these inequalities.

Efforts to Reduce Financial Inequalities

Permanent school emergency fund and minimum wage for teachers fund.—Educational leaders in Colorado long ago realized the inequalities in school conditions and maintenance. The public school emergency fund and later the minimum wage for teachers fund were created in an attempt to overcome these inequalities. Neither fund provided any additional source of aid. Both were provided by setting aside out of the public school income fund a certain sum of money to aid especially needy districts.

The permanent school emergency or call fund was created in 1911.[83] From the income of the public school fund $20,000 were set aside to aid any district which, through unavoidable misfortune or casualty, might be unable to provide from the combined proceeds of the special tax and its quota of the general fund by apportionment proper and necessary school facilities. I find no record of any transfer to this fund since the biennium 1912–1914.

The minimum wage for teachers fund, created in 1913,[84] provided for setting aside out of the income from the public school fund a sum not to exceed $60,000 to be paid to districts unable to derive from all other state, county, and district school revenue a sum sufficient to pay each teacher employed in the district at least $50 per month for six months.[85] This act was important

[83] *Colorado session laws*, 1911, p. 143.
[84] *Ibid.*, 1913, chap. 156; *Colorado state treasurer's report*, 1915–16, p. 49.
[85] *Colorado school laws, annotated*, 1917, pp. 168–70, sec. 340.

not only in providing this fund but in several other respects as well; it recognized a new basis of apportionment, namely, the number of teachers employed; it provided a new method of apportioning the general county tax proceeds; it created a leverage for encouraging both districts and counties to tax themselves to the maximum. In this law we discover an effort to stimulate local taxation in the provision that no aid shall be received from the minimum wage for teachers fund by any county whose commissioners fail to make the maximum levy.[86]

The legislation of 1919 continues the minimum wage for teachers fund with few but important modifications. The sum to be drawn for this purpose, from the income of the public school fund, is raised to $150,000.00; and the minimum salary of teachers in third-class districts is put at $60 per month and at $75 for first- and second-class districts.[87]

Table XIII shows the condition of the fund for 1914 to 1920.

TABLE XIII. MINIMUM WAGE FOR TEACHERS FUND. RECEIPTS AND DISBURSEMENTS, 1914–1920

	1914–16(a)	1916–18(b)	1918–20(c)
Balance from previous biennium	$7,404.35	(d)	.....
By receipts fund	48.00	(d)	.....
Transferred from income of public school fund	40,000.00	(d)	$150,000.00
Total	$47,452.35	$6,218.64	$150,000.00
Paid to county for districts	41,233.71	6,218.64(d)	.....
Balance, Nov. 30	$6,218.64		

a *Colorado state treasurer's report*, 1915–16, p. 49. b *Ibid.*, 1917–18, p. 9.
c *Colorado educational laws*, 1919, pp. 35–36, sec. 3.
d None reported except balance for biennium 1914–1916.

Suspension of tax limit.—In 1917 it was enacted that except as otherwise expressly provided, the exercise of taxing power of every taxing body in the state, including the general assembly, shall be limited so as to prohibit the levying of a greater amount of revenue for any year hereafter than was levied the preceding year plus 5 percent. However, districts desiring to increase their tax rate beyond 5 percent may appeal to the state tax commission.

[86] *Ibid.*, p. 169, sec. 340.
[87] *Colorado educational laws*, 1919, pp. 35–36, secs. 1–3.

If the commission refuses or fails to recommend such an increased levy, or if the excess levy, not exceeding five mills, is not sufficient to meet the needs, the question may be submitted to the voters of the taxing district and if three-fourths of the voters cast their votes in favor of an increased levy, the tax officers may make such an increased levy for the year voted upon.[88]

Needs and Recommendations

The school emergency fund, the teachers' minimum wage fund, and the law providing for excess tax rate no doubt have provided possible relief for a limited number of districts. Nevertheless what is needed in Colorado is not a fund which will enable a limited number of her poorest districts to attain a level far below that of the state average, but rather a system of school finance which will provide for the following:

1. A current state school fund which, together with the income from other assured state sources, will be sufficient to enable the state educational authorities:
   (a) To supply quotas which, together with local school revenues, will make it possible for the state authorities to see that every community maintains a satisfactory school for a period of not less than nine months;
   (b) To protect the "infant industries," that is, to foster new studies, new types of schools, and in general, new educational projects;
   (c) To furnish incentives in the form of state aid whereby indifferent but capable units will be stimulated to greater and greater effort;
2. A scientific method and basis of apportioning school moneys;
3. Definite requirements to be fulfilled as conditions for receiving quotas from the general state apportionment.

In addition to modifications based on general principles, various other changes of more local nature should be made. Most important of these are: (1) A modification of the present method of the management of school lands and the investment of school moneys belonging to the permanent public school fund; (2) Increase of the county tax levy; (3) The provision of means whereby

[88] *Colorado school laws, annotated*, 1917, p. 10, sec. 15; pp. 163–64, sec. 333.

the levy and assessment of at least the required minimum rate can be assured.

Management and investment of public school funds.—It has been stated in a preceding paragraph that the year 1918 marked a radical improvement in Colorado's manner of investing the principal of her public school fund. Whereas in 1916 nearly one-fourth of the moneys belonging to this principal were uninvested and lying on deposit in banks throughout the state, in 1918 no moneys are reported as deposited in banks. Again, in the former year state warrants and bonds constituted the chief securities, whereas in 1918 we find the fund invested in United States bonds, county, municipal, and district bonds and farm loans.

Care and sale of school lands.—There has been no lack of dissatisfaction in the past with Colorado's policy respecting her school lands. Register Hoggat was undoubtedly expressing the judgment of many when he wrote in 1914:

> The state of Colorado should as quickly as possible get out of the land business. All our state lands should be sold to actual settlers or to those who will improve them as the state deems for its best interests and the promotion of their settlement, as our laws plainly direct. The state is a poor landlord and the leasing of state lands should be minimized.[89]

The chief reason given by Register Hoggat for urging the sale of Colorado's 3,293,997 acres of unsold school lands is that the proceeds of the sale of this land, properly invested, would supply the schools with a revenue nearly three times as great as that derived from renting them.

Certainly no effort should be made to hasten unduly the sale of large school land areas until a thoroughly satisfactory system of investing the proceeds of these sales has been worked out. The need is not to get rid of these lands as rapidly as possible, because "the state is a poor landlord" but to insist that the state become a good landlord. The individual citizens of the state should be made to realize the vast prospective value of these lands, the complete impossibility of caring for them with the present meager staff and the meager expenditure allowed to the board of land commissioners.

A state school tax.—The objects for which a sufficient state school revenue should be provided have been pointed out in

[89] *Colorado state land commissioners' report*, 1913–14, pp. 4–5.

an earlier paragraph. In the year 1914–1915 Colorado's total expenditure for public schools was $6,778,503, of which only 8.8 percent ($598,607) was from state revenue.[90] Such a sum is entirely too small to accomplish the purposes which should be realized through state aid. The experience of a number of our states has shown that a permanent common school fund should not be relied upon as the chief source of state school revenue. The only method of providing a state fund sufficient to keep pace with the increase of the school needs and sufficient to enable the state, first, to make up for the inequalities existing between individual communities and, second, to exert the influence which should be exerted, is the levying of a state school tax. Neither special appropriations which depend upon the judgment and attitude of the legislature from year to year nor the income of a permanent fund can in any sense take the place of a state tax.

A question of supreme importance is what proportion of the total revenue for common schools should be furnished by the state. Monahan and Cook are of the opinion that the state should furnish approximately one-third.[91] The same ratio has been suggested by various other writers. It would be just as sound *a priori* to suggest one-half or one-tenth. It is unnecessary, however, to be satisfied with any such *a priori* or arbitrary answer to our question. A scientific answer can be arrived at by determining (1) what items of school expenditure are most important in determining educational equality or inequality; (2) by assigning all such items of expenditure and support to the care of the state; (3) by ascertaining what percent the total cost of the sum of such items will constitute of the total expenditure for common schools. Elsewhere I have given this topic a somewhat full treatment.[92] It will, therefore, be sufficient to present at this point merely a summary of conclusions.

The factors which to the largest degree determine the equality of educational opportunity offered by the various communities of a state are (a) the number and quality of teachers employed; (b) general control and supervision; (c) apparatus directly related to instruction, including such materials as library books, labora-

[90] *United States commissioner of education report*, 1917, 2:51, 53.
[91] *Report of the Colorado school system*, p. 45.
[92] See SWIFT, F. H. "Existing educational inequalities," *American School Board Journal*, 60:29–30, May 1920.

tory apparatus, and textbooks. Until the state provides, directs, and distributes these factors, the present chaos of educational inequality will continue.

Upon the basis of present conditions it seems safe to say that the proportion of the total expenditure to be borne by the state would range far beyond the suggested one-third, perhaps leaving little more than one-third to be borne by the local unit. It is doubtful whether at the present time it would be practicable, even if possible, for any state to assume at once the full measure of responsibility we have suggested. Of one thing we may be sure, namely, that it would be unwise to establish for the United States as a whole or even for one state any inflexible percentage division between state and local units. Both the rate of the school tax, state and local, and the percent of costs to be provided from state and from local sources respectively should be left to some supreme state board or agency so constituted as to be entirely free from political influence. Such a board or agency should have the power not only to determine these matters but to modify the percentage division and the tax rate from time to time as conditions demand.

Reforms in county finance.—The present law requires every county to levy annually a general county school tax of not less than two mills. Yet a survey of 1914–1915 showed that out of the 63 counties in the state, 50 levied a tax less than two mills, and only 3, Mineral, Gilpin, and Logan, a tax exceeding two and a half mills.[93] It is evident that the first reform needed with respect to the county school taxation is the creating of some agency whereby counties shall be compelled to levy, assess, and collect the minimum school tax. In the case of districts which fail to levy the required district school tax, the county commissioners are empowered to levy it. A similar policy should be established whereby state officials should be empowered to levy and collect a minimum county school tax in all counties which fail to do so of their own accord.

The inequalities in valuation and in tax rate between school districts and the inadequacy of school facilities show conclusively that the rate of the county minimum school tax (the chief source

[93] *Report of the Colorado school system*, p. 43; *Colorado school laws, annotated*, 1917, pp. 161–62, sec. 331.

of county school fund) should be increased sufficiently to insure, together with the quotas received from the state and district, funds necessary for providing a satisfactory school in every community. From this consideration of the reforms needed in the provision and care of the sources of school revenue, we shall now turn to the modifications needed with respect to the disbursement of school funds.

A reformed method of apportionment.—It is undoubtedly true that at the present moment even more important to Colorado than larger revenues is the adoption of a scientific method of disbursing school moneys. If the present funds were apportioned according to a sound method and conditioned upon the local community's fulfilling the proper requirements, the inequalities and defects would be greatly reduced. This leads naturally to a consideration of the changes needed: (1) in the conditions of participation in the state school revenues; (2) in the method and basis of apportioning school moneys.

Conditions of participation.—By making maintenance of a school for the minimum legal term the sole condition which the district must fulfill in order to receive its quota of state aid, Colorado has failed to employ one of the most effective of all means by which established standards can be enforced and new ones introduced. The following list compiled from requirements imposed by other states suggests something of what Colorado might do: (1) raising of a local tax; (2) lawful expenditure of school moneys; (3) employment of teachers of specified qualifications; (4) maintaining a school for a fixed number of months; (5) providing equipment satisfying state standards; (6) providing instruction in the subjects required by law; (7) submitting the reports required by the state or other educational authorities; (8) provision of free textbooks; (9) enforcement of compulsory education and truancy laws; (10) fulfilling all state school laws and regulations.

Reform in the method and basis of apportionment.—Earlier paragraphs have shown: (1) that in comparison with other commonwealths in the Union, Colorado is well supplied with school moneys; and (2) that the portion of state and county aid given a district bears little or no relation to its valuation or to its local school tax. State moneys are apportioned among the various

counties, and county moneys among the various districts on the same basis, namely, the school census (persons six to twenty-one years). School census is the most ineffective, unfair, and disastrous basis employed in distributing school moneys to be found in the United States today. Moreover, Colorado's school census age is fictitious. A considerable portion of the population in any county or district falling within its limits do not attend school at all. Furthermore, the compulsory school age is from eight to sixteen years. Thus, whereas the compulsory school age covers only nine years, the age upon which the school moneys are apportioned covers sixteen years. Apportioning school moneys upon the basis of the school census results in giving individual communities aid for hundreds or thousands of children between fourteen and twenty-one who are not even enrolled in school. The result is that more populous districts receive an undue amount of aid.

Furthermore, the school census basis ignores entirely two of the most important factors involved: (1) the financial resources of the unit aided; (2) the degree of effort it makes to maintain its schools. Monahan writes:

> The distribution of the State funds on the census basis does not equalize the burden between the counties due to the unequal valuation per school child, nor does it contribute to the counties in proportion to what they are doing for the education of the children of the State. The cost of maintaining schools does not depend upon the number of children living in the county, or district, but upon the number who attend school, the number of days school is maintained, and the number of teachers employed. A distribution on the census basis takes none of these essentials into consideration. This is particularly true where the (school) census includes all persons from 6 to 21 years of age, or 5 years beyond the compulsory age limit and 2 years beyond the normal age of graduation from the high school.[94]

Elsewhere the same writer continues:

> The county (school) tax, distributed as at present, works to the advantage of the first and second class districts and to the disadvantage of the third class districts, where the cost of maintaining schools of an equivalent standard is usually greater than in the first and second class districts. This is because there are necessarily employed in country districts a larger number of teachers in proportion to the number of children than in city districts. . . . If the county money were distributed also on the basis of the number of teachers employed, third class districts would receive from the county fund on the whole an amount greater than that contributed by them.

[94] *Report of the Colorado school system*, pp. 36–37.

The contrary is the case.[25]

Basic principles of a scientific and just method.—A method of apportioning school moneys which was fairly satisfactory amid the simplicity of social and economic conditions of earlier days will no longer suffice. The complexity of our social and educational situation demands a more complex method. Such a method must take into consideration not one or two but several factors in the educational situation. It must rest primarily upon clearly defined aims and conceptions. It must be such as to favor the poorer and more helpless school units rather than the richer and more capable. In determining the amount of state aid to be granted to any school unit, consideration must be given to the following facts at least: (1) actual school attendance; (2) length of the school terms; (3) number and grade (as indicated by the grade of certificate, or by the professional training) of the teachers employed; (4) valuation of local unit; (5) local school tax. The requirements upon which such a grant should be conditioned have already been discussed.

Fundamental defects in current method of school support.—Despite the fact that Colorado has enormous school revenues at her command, educational opportunities and burdens have long been and still are disastrously unequal. The policies employed for providing school revenue not only in Colorado but also in many other states of the Union are a direct though unconscious outgrowth of the charity conception of education. Instead of attempting to determine accurately in advance by scientific methods how much money will be needed (1) to guarantee that every child of school age shall be in school, and (2) to insure proper school facilities to every such child, nearly all our states, and the school units within them, set aside what appears to be a goodly array of sources of school revenues. This done, they collect each year more or less completely the revenues which these sources furnish. Then, to the school authorities, they say in substance, "This year you have . . . dollars. With this you must maintain your schools." It would be difficult to imagine a more unscientific or a more disastrous method. Its results are evident in the inexcusable and wickedly unjust variation which we find existing between both communities and states.

[25] *Ibid.*, p. 44.

Conclusions

National funds and federal authority as remedies for existing inequalities.—In 1917–1918, whereas Montana's average expenditure per child in attendance was $80, Rhode Island's was $47, and Mississippi's $12. Again, whereas in Montana the average number of days of schooling per child was 131, in Texas it was 79 and in Louisiana only 53.[96] It is impossible to contemplate the conditions which such data bespeak without asking whether the states in our Union ought not be held responsible to some authority outside themselves for the discharge of their educational responsibilities. Our federal government has left to the states the provision and care of education. To insure the satisfactory fulfillment of these functions by the states, or at least to aid the states in fulfilling them, the federal government has given to the states out of its own wealth vast fortunes in lands and money. The aim of these gifts was to make education universal, free, and equal. All data at hand show conclusively that not one of these aims has been realized in a single state. As long as education continues to be administered under the conception that it is a state and not a national enterprise, so long will thousands of children in many of our states be deprived of their educational birthright. As in any efficient school system, the county holds each district responsible, and the state holds each county responsible, so sooner or later must the nation be able either to hold each state responsible for properly discharging its educational responsibilities, or to furnish sufficient incentives and pressure to induce every state in the Union to furnish proper educational facilities for all its children.

It lies without the scope of the present study to undertake to outline the steps by which such a revolution in the administration and support of our schools is to be accomplished. It must undoubtedly be brought about by an educative process, rather than by a sudden drastic attempt on the part of the federal government to force its way into the control of state systems of schools. The two steps which should undoubtedly be undertaken first are embodied in the Smith-Towner Bill, at the time of this writing awaiting action by Congress. It includes the establishment of a national department of education and the creation of a national

[96] *Statistics of state school systems, 1917-18*, pp. 69, 108.

educational fund to be employed in equalizing the burdens and opportunities of our states. Even if this bill should fail to become a law, it is unthinkable that its aims should not ultimately be reached.

If the Smith-Towner Bill to create a federal school fund fails, one might inquire why the beginning of a national school fund should not be made by recalling the twenty-eight millions of surplus revenue loaned to the states in 1837. The principles in accordance with which such federal aid should be distributed among the states would be largely the same as those in accordance with which states should distribute aid among their constituent units. Federal as well as state, minimum, educational standards should be formulated. States should be given a reasonable period of time, not to exceed five years, during which to meet such standards. States failing to meet these standards within the set period should be compelled by federal authority, or by public opinion which is the source of federal authority, to levy a state school tax, the proceeds of which, together with all other funds including the special federal aid, would be sufficient to provide educational facilities satisfying the national standards.

If such a policy were adopted, it would no longer be true that a child's chance for securing an education and the quality of the education secured would depend upon whether he were born in Mississippi or in California, in Baca County, Colorado, or in Sedgwick. His opportunity for an education and the assurance that the education given would be given under wholesome and helpful conditions would depend upon the only thing upon which they should depend in a fabulously rich democracy, namely that he was a child of the republic and a citizen in the making.

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Editorials

CRUMBS OF COMFORT

It may be assumed that every human enterprise has its following. Back of every endeavor, however trivial, is the conviction of at least a few that it is worth while. Its friends, although they may not be numerous, may support each other more effectively than a host of less consecrated followers. Under these circumstances a member of an association for improving this or preventing that may easily mistake the approval of a handful for the plaudits of thousands. He may even develop a protective scorn for the applause of the crowd—for what Doctor Chalmers called "the hosannas of a driveling generation."

We do not wish to make these mistakes, and as we lean backward in an attempt to stand straight, we try to be coldly critical. In particular, we examine the many fine things people are saying about our Journal and we speculate as to whether they arise from conviction or a desire to please. Of course, even in this mood we hope they arise from conviction. But the mood simply won't hold. We realize with humility that even if our friends merely desire to please us, they succeed admirably. The real fact must be admitted. We like to have folks say nice things about us. We are like Lincoln—though not very much like him—who, when Judge Douglas persisted in sarcastically referring to him as "the amiable gentleman from Sangamon County," remarked that he enjoyed flattery; in fact, that in regard to flattery he was like the Hoosier in regard to gingerbread who declared that he thought he liked it better than any other man in the world and got less of it.

Possessing these altogether human but not generally avowed characteristics, and being rather inclined to believe that our friends, though constituting but a "few cases," are, nevertheless, a random sampling from a total population—possessing these characteristics and having such a belief, we were astonished to receive recently from one of our English correspondents the following statement with reference to our Journal: "What amazes me

is that there should be money and interest enough in America to make such a venture possible." Money enough! We rather supposed that the European notion of America, however belittling otherwise, contemplated a rather disgusting degree of wealth. And interest! Employing a vernacular which our English friend may have to look up, where do you get that stuff? If educational research from transatlantic quarters is sufficient to make American interest in it seem questionable, we have failed utterly to locate its source of supply. Our correspondent, moreover, is not ill-informed, at least not in other respects, but his amazement is—well, amazing.

Of course, we wrestled with something like this question at the time the JOURNAL OF EDUCATIONAL RESEARCH was being organized. We very much wanted to know whether there was "interest enough in America to make such a venture possible." As to money, we weren't so much concerned about the amount in America as we were in the amount that could be diverted to the purchase of our periodical. We proved to our own satisfaction that the interest already existed, and we had faith to believe that the money would be sufficient to finance the undertaking.

In spite of the erroneous belief—reasonable enough at the time—that prices of publication were at the peak last January, our friends will be glad to know that we have come through with an impressive justification of our faith and of theirs. But at first it was not altogether easy even to convince some of our friends. One conscientious objector was reluctant to cast in his lot with us because he feared that not enough good copy could be obtained to sustain such a periodical. It seems, however, that research workers have been particularly active in recent years, and that at the same time facilities for publication have become more and more meager. Interest in research has been evinced, not only by an increased volume of material suitable for publication, but also by an enlarged reading public—a public which, not content with merely reading our articles, has the amiable habit of telling us how much it enjoys them.

Naturally, we like to think all this is because of the real worth of our Journal, and we are not without evidence that this may be the case. For example, not long ago we applied for the privilege of exchanging with an important periodical. The editor, to whom

we had applied, wrote saying that he was glad to make the exchange; and then he added, "We have an absolute rule against such exchanges and your publication will be the only one on our list."

When to the smiles of a band of enthusiastic friends is added the handclasp of an "esteemed" contemporary, we sigh with satisfaction, and unchallenged we allow to steal into our mind the notion that we have arrived.

Crumbs of comfort! B. R. B.

ON OBJECTIVES IN READING

In a recent issue of an educational periodical which maintains a "Question and Answer Department," the following were published:

What are some of the standards by which I may judge good reading in the eighth grade?

(a) Ability to speak clearly and correctly in a well-modulated tone so that the listener hears, comprehends, and feels what is said.

(b) Ability to show through voice quality and control that the reader has grasped the essential thought in the selected reading.

In view of the fact that silent reading has received much emphasis during recent years through the use of silent reading tests and in other ways, it is surprising, if not astonishing, to find the above question answered entirely in terms of oral reading. Until teachers incorporate in their conception of the objectives to be attained in the teaching of reading the idea that, after the pupils pass above the primary grade, silent reading is the most important elementary school subject, and also until teachers realize that the type of reading instruction which has been given in our schools (and appears still to be given in some localities) will not effect that objective, our schools cannot hope to attain a high level of efficiency. When a pupil has his attention centered upon speaking clearly, correctly, and in a well-modulated tone and when he knows that both the teacher and other members of the class are paying attention to his reading primarily to discover errors which he may make, he cannot be expected to give attention to the meaning of what he is reading. Furthermore, he can never learn to read rapidly. As a result he will enter upon his work in high school and college with a distinct handicap.

W. S. M.

AVERAGES

Not long ago after we had addressed a splendid audience, a discussion took place, and in the course of it one of the school men raised the question of the value of an average. From the conversation that ensued it was apparent that he entertained some hostility to it. This is an attitude which we have encountered before, and it seems to us unfortunate.

The critics of the average as a valuable device propound such problems as the following: There is one man in a village of 500 persons whose fortune amounts to several million dollars. None of the rest is of more than moderate means. Is the average wealth per person in the community worth anything? or again: Professor A teaches two classes, the first of one hundred students and the second of four students. The average size of a class is fifty-two. Does this average have any meaning?

In the first place we wish to observe that the term "average" has a general meaning. It is not merely the arithmetic mean—not merely, in other words, the sum of the measures divided by their number. All measures of central tendency are properly called "averages." This includes the median, the mode, the arithmetic mean, and various other means. A criticism which contemplates only one of these averages is unintelligent. The median is an average which would very nicely take care of the problem of the small village containing the multi-millionaire. It would give no more weight to his fortune than it would to any fortune larger than the middle one.

Moreover, an average is not worth very much when derived from a very few measures nor from measures that are widely scattered. Nobody, for example, is interested in knowing the average size of Professor A's two classes. It is much more satisfactory to say that he teaches one class of a hundred and another of four students. Indeed, the reliability of an average depends upon but two considerations—the number of measures and their dispersion. The critic of the average is therefore basing his criticism on the most extreme case when he proposes the smallest possible number of measures (two) and assumes them to be widely separated.

Yet there are conditions under which the average is useful even when derived from two measures. If Professor A taught two

classes as widely different in size as we have indicated and it were possible to equalize them, we should do so on the basis of as close an approximation to fifty-two students per class as possible. An interesting example of this sort of use of the average may be shown. The army psychologists found that the distribution of mentality in various regiments was markedly different. Two regiments in the same organization are mentioned by Yoakum and Yerkes. The first had 1 percent of its membership in class A (very superior intelligence) and 3 percent in class B. The second had 6 percent in class A and 12 percent in class B. Similar differences existed for other grades of intelligence. The psychologists suggested a "balanced distribution of intellectual strength." They did so on the basis of the arithmetic mean. In other words, they suggested that each regiment be organized so that 3.5 percent of its membership should be of A intelligence, 7.5 percent of B intelligence, etc. It is clear that no better basis could be suggested than this because it produces equality.

With respect to large numbers of measures, the truth is that the human mind insists upon having some one portable figure which can stand for the general weight of series. If we obtain the scores of children in a rate of reading and we wish to express a group result, we can best do it by the means of an average. Those who object to this procedure do so in something like these words: "One child reads at the rate of 200 words a minute and another at the rate of 150 words a minute. The average is 175; but neither child reads 175 words per minute. The average is therefore a false statement of the achievement of these children." The reply is that 175 does not purport to be a child's speed of reading. It purports to show the achievement of the group as a group. Care must be taken, then, to give to the average the meaning which properly belongs to it.

In the case we have just cited, the group consisted of but two children and the conditions in respect to the number of measures were again as unfavorable as possible. Other things being equal, if there were eight children in the group the reliability of the average would be twice as great; and if there were eighteen it would be three times as great. Evidently a criticism of the average must take account not only of the number of measures out of which it arises but also of the use which is to be made of it, and the meaning which attaches to it.

It is not too much to say that the conception of average enters into all our thinking. It is as idle to quarrel with the idea of average as to quarrel with the idea of any other middle course. Lloyd George in a speech on October 8, after declaring that the great issue was peace, continued: "The only way to reach such peace is to take the middle course, especially at this moment because you get the antagonism of extremes from both sides." This is the argument for a coalition government. Extreme radicals and extreme conservatives, extremists in short of every type, do not like compromise. They are for an out-and-out policy. But the common sense of the rest of the world seldom gives them an opportunity to carry such a policy into effect.

In recognition of the value of an average as a guide to conduct, we have the phrase "the golden mean." We apply the notion everywhere. We are applying it today, for example, in the measurement movement, for we are accepting neither the scoffer nor the enthusiast as a worthy guide. We apply it in our thinking, as indeed we must if we think at all; for the concept is itself a kind of average in which the measures are observations, the computer is an experiencing nature, and the result a generalization. We apply it in business and the daily round of duties. An in-between attitude is commonly felt to be truer than an extreme position in any direction. Hence the compromise and the give-and-take of life. The average is not as spectacular as the extremes; but it is safer and it is indispensable.

B. R. B.

Reviews and Abstracts

LINK, HENRY C. *Employment psychology.* New York: Macmillan Company, 1920. 440 pp.

As its title implies, this book presents the theory and practice of psychology applied to the selection, training, and grading of employees. Part I is devoted to a discussion of psychological tests; Part II to trade tests and other applications of employment psychology; Part III to selection and retention of employees; Part IV to conclusions.

The book is extremely well written, and the argument is convincing. Although the method developed is scientific and technical, the language is such that any layman may expect to read the book with understanding and profit. Indeed, such an example of clarity in psychological writing might well be brought to the attention of the younger generation in our colleges as an ideal toward which to strive.

The author has been careful in his claims for his findings. In fact, as is pointed out by Professor Edward L. Thorndike in his introduction, the story of the experiments is more conservative than needs be, for the author could have obtained even better prediction of success at a given job than he did obtain, by applying the technic of partial correlations and the regression equation.

An appendix contains a list of forty-one tests used by the author, with complete explanations of the general procedure of giving them and the method of rating. Among these are tests for factory inspectors, clerical help, typists, stenographers, comptometers, tool makers, and gunsmiths.

The author's chief contribution to the subject of employment management is his treatment of method rather than the tests as such, together with his recognition of the fact that jobs and positions in industry are based not so much on *degrees* of intelligence as upon *kinds* of intelligence or ability. "To be sure, every kind of ability has degrees; but it takes much finer tests than general intelligence tests to determine what these are." A technical man may possibly find even Dr. Link's trade tests of too coarse a mesh for the purpose intended.

The book is to be recommended highly to all those interested in the application of more science to the problem of selection, training, and grading of employees.

IRA S. GRIFFITH

BRANOM, MENDEL E. *The project method in education.* Boston: Richard G. Badger, The Gorham Press, 1919. 282 pp.

The project method in education has at least two sets of proponents and one of opponents. Of the former, one group maintains that the term project should be restricted to fields where concrete objective achievements are possible while the other would concede the possibility of purely intellectual projects. The principal argument of the opponents is that the project method is not a contribution to education but is merely good teaching camouflaged.

No matter to what camp the educator belongs, he will find Mr. Branom's book of interest especially from the historical viewpoint. The literature of the project is

scattered through various periodicals, circulars, and N. E. A. proceedings. Mr. Branom has brought together and evaluated all of this material in his chapter on the "Evolution of the Project as an Educational Concept."

The author is catholic in his views and sums up what he terms as futile attempts to restrict the use of the term *project* as follows: "When the attempt has been made to recognize the project as a special lesson type, all other types have not been justified except in so far as they contributed in some important fashion to life's projects. The various other types consequently are seen to be inseparably and inextricably integrated with the so-called project, which accounts for the inability satisfactorily to use the term project in a restricted sense. This integration and constant expansion of the term to cover the various lesson types suggest the need of using the term as a concept that includes all intellectual growth and therefore all types of lessons. In fact, the various lesson types, if properly presented, are ways of getting at that type of development that differentiates the human being from other animals, and the one method of growth, whether considered genetically, historically, or on the basis of present educational usage, properly may be termed the project method."

The reader may gain the impression that the writer feels it to be necessary to justify the project as the educational vehicle par excellence. The chapter on "The Relation of the Project Method to Instincts" is a case in point. Here Mr. Branom calls educational psychology to his aid to show that "it is through the project method that the hopes of the civilized world are realized."

One might criticize the author's arbitrary classification of project-types, into the question project, exercise project, problem project, and complex project, although it may be excused on the ground of the propagandist's need for dogma. In succeeding chapters, each of these types is described and discussed.

Other chapters deal with the project method in history and geography respectively. These will prove of great practical value to the teacher. The two concluding chapters deal with the reorganization of the curriculum and the preparation of teachers for project teaching. In the first of these, the author has indulged in the types of glittering generalities which have been much in vogue, but without giving any specific suggestions. The same criticism may be made of the last chapter. One point, however, is made by the author, which seems to the writer to be of first importance, namely that the project enthusiasts are mistaken in claiming that the project method should teach itself. Mr. Branom believes that even better trained teachers will be required. His argument that in normal school, college, or university classes where a prospective teacher must quickly and comprehensively cover a field of knowledge, the project method should not be used, may seem a little out of place in his general thesis.

While the author may seem to go rather far afield in his academic discussions and to be "serving old wine in new bottles," the charges are after all not serious. The teacher, who is a project enthusiast, or his sister or brother, who is embarking for the first time on the educational sea and the old educational "salt" who likes his plum duff served up in new ways, will all find the book an interesting addition to the professional library.

JAMES H. GREEN

News Items and Communications

This department will contain news items regarding research workers and their activities. It will also serve as a clearing house for more formal communications on similar topics, preferably of not more than five hundred words. These communications will be printed over the signatures of the authors. Address all correspondence concerning this department to Walter S. Monroe, University of Illinois, Urbana, Illinois.

Tests by the U. S. Bureau of Education

The United States Bureau of Education announces a group of predetermination tests for ability in foreign languages. These tests are being worked out by Professor Handschin of Miami University, Oxford, Ohio, under the direction of the Bureau of Education. It is the hope of Professor Handschin to secure a test which will aid in classifying pupils who are beginning the study of some foreign language.

Superintendents' Conference

On November 17 and 18 the Bureau of Educational Research of the University of Illinois will hold a Superintendents' Conference. This meeting occurs for the first time this year. The High School Conference—an annual meeting of long standing—meets during the same week. The superintendents will be addressed by Professor Charles H. Judd and Professor M. E. Haggerty. It is hoped to make the Superintendents' Conference an annual gathering devoted to the reporting of educational investigations.

Pennsylvania Educational Congress

Doctor Thomas E. Finegan, State Superintendent of Public Instruction for the Commonwealth of Pennsylvania, has announced that the second annual session of the Educational Congress will be held at Harrisburg, November 11, 12, and 13. The Congress is called again this year with the cordial approval of Governor Sproul.

This Congress will devote its time to the consideration of the report of Colonel Leonard P. Ayres of the Russell Sage Foundation on the evaluation of state school systems. Doctor Finegan stated, in announcing this session of the Congress, that he believed the educational workers and people of the state desired to know the exact points in which the school system of the state is not progressive in order that such remedial action may be taken as appears necessary to make the school system of Pennsylvania conform to the generally accepted modern and efficient standards.

Governor Sproul will preside at the opening session and will make an address.

Colonel Ayres, who directed the work in connection with the evaluation of school systems of the several states and who prepared the report which is to be considered, will attend the Congress and will deliver the principal address at the opening session.

An advisory committee will be selected to aid in the preparation of a program which shall cover the three days' session of the Congress.

Size of Class and School Efficiency

The Bureau of Educational Research of the University of Illinois is cooperating with the school officials of the city of Chicago on a project to determine the effect of size of class on efficiency of teaching. Eight schools have been placed at the disposal of the Bureau of Educational Research in conducting this investigation. One hundred thirty-two classes are participating, and consequently, 132 teachers; the number of pupils involved is about 4,500. In the elementary school, classes of the second, fifth, and seventh grades have been selected, and in the high school, classes of the second year. The second grade is taken as typical of primary conditions, the fifth as typical of intermediate classes, and the seventh as typical of advanced grades.

The experiment is being conducted under the personal direction of the director of the bureau with the assistance of Mr. P. R. Stevenson, who has lately been appointed research assistant. Eleven conferences have been held in Chicago with the superintendents, principals, and teachers. As a result of these conferences principals and teachers have been instructed in the procedure to be followed in conducting the experiment and in the method of administering the tests on which the data will be based. These tests are to be given on six successive days, beginning with October 6.

The feeling is shared both by the Chicago people and by the Bureau of Educational Research that this experiment is highly significant, and is likely to yield important evidence on the question of the influence of size of class on teaching. Moreover, this question is administratively of profound importance. Studies of the cost of teaching have shown that of all the factors to be considered, size of class has greatest influence. If, without detriment to the instruction, the prevailing size of class in a given school system may be raised by as many as five children, the number of teachers required to do the work will be materially decreased. This would effect a saving not only in salaries but in physical plant and equipment. If, on the other hand, a decrease in the sizes of classes in a given school system will be unquestionably accompanied by a substantial increase in opportunities for boys and girls to secure better training, then the question of expense may become secondary.

From another point of view the problem resolves itself into this: With a given amount of money at the disposal of a board of education for teachers' salaries, is it better school management to provide for a relatively few well-paid teachers who instruct relatively large classes than to provide for a relatively large number of lower-paid teachers instructing smaller classes? In other words, is it better policy to employ a few good teachers or many poor teachers?

The Chicago experiment will be conducted for at least a year. It is hoped that not only the school system of Chicago, but also school systems throughout the state and the nation may be benefited by the findings.

University, College, and Normal School Courses in Educational Measurements

Seldom in so short a time does any subject attain the prominent place that educational measurement has gained in the field of education within the past decade, indeed mostly within the last five years. Ten years ago the idea of scientific, standardized tests and scales was in its very infancy, five years ago it had but gained a foothold, now it occupies a large place in educational thought and literature. This development is well marked by the amount of time and attention given to courses in this field by the various institutions that offer work of collegiate rank. The study herein reported was made with the purpose of revealing the present status of the movement.

A request for a 1920 summer session bulletin was sent to each institution listed in the United States Bureau of Education Directory. Replies were received from about 70 percent of those listed. These include almost all schools having more than local fame and standing. It is probable that those institutions for which no data are at hand do not, on the average, offer as much work in this line as those studied, since their average size is considerably less.

The schools studied were grouped thus:

Group I. State universities
Group II. State normal schools
Group III. Other state schools
Group IV. Non-state universities
Group V. Non-state colleges
Group VI. Non-state normal schools.

It is doubtless true that in many cases some attention is given to educational measurements in courses whose titles or descriptions do not indicate this content. In this study an institution was counted as offering work in educational measurements only if the title of the course or its description explicitly indicated this content. The explicit recognition of educational measurements by these institutions is shown by the following table, in which the Roman numerals indicate the groups to which the institutions belong:

	I	II	III	IV	V	VI
No. of schools offering work in measurements	29	37	5	14	8	0
No. of schools not offering work in measurements	5	34	14	17	54	16

It is apparent that state universities are well in the lead, with state normal schools second. As the institutions of Group III are largely agricultural, professional, etc., it is not surprising that so few offer this work. When we consider that almost all collegiate institutions claim to train teachers it is surprising that no more than 45 percent of the non-state universities, 13 percent of the colleges and none of the private normal schools offer this work. The fact is that state universities and normal schools (with some of the younger non-state universities) are leading in this movement, while such long-established centers of learning as Yale, Princeton, and Dartmouth do not offer a single course in this field, but repeat the history of educational progress along many lines.

In this connection it is interesting to note that a study of offerings in Education for the year 1915–1916 showed that only 10 of the 37 state universities studied were offering courses in educational measurements at that time. Along with these were a very few other universities and several normal schools.

The next table shows a few further facts, for each of the five groups of institutions which offer courses in measurements.

	I	II	III	IV	V
Average number of courses per school	1.8	1.4	1.0	2.5	1.3
Average number of semester hours per school	3.8	3.0	2.3	5.7	3.1

The chief point here is that, as a whole, these non-state universities which do offer such work are well in the lead in the amount offered. Their average does not, however, represent the typical institution of this group as the presence of the University of Chicago, with eight courses, Stanford University and Teachers College, Columbia with five each very greatly raises the average. Without these three it would be lower than that of the state universities. Here Illinois and Michigan lead with five courses each, as also has Colorado State Teachers' College.

The study of 1915–1916 referred to above showed an average of 1.2 courses and 3.0 semester hours for the ten state universities giving such work.

An analysis of the courses offered according to content shows the following number of courses of each kind:

Group	I	II	III	IV	V
1. Intelligence Tests: elementary course	10	6	0	7	2
2. Intelligence Tests: advanced course	2	1	0	0	0
3. School subject tests: elementary course	18	20	2	9	4
4. School subject tests: advanced course	0	1	0	2	0
5. Both kinds of tests: elementary course	4	9	1	4	2
6. Both kinds of tests: advanced course	0	1	0	1	0
7. Tests and statistics	7	3	0	2	1
8. Other courses which include tests	11	11	2	10	1

Under No. 3 a few schools list separate courses dealing with elementary- and high-school subjects. No. 8 includes such courses as educational psychology, administration, surveys, educational literature, etc., where the descriptions show that educational measurements is a part of the course.

C. W. Odell

Some Correlations Between Otis Scale and Rogers Mathematical Tests

In January 1920, a selected group of pupils of the Champaign High School were given the Otis Group Intelligence Scale and the Rogers Mathematical Tests. This group of pupils had studied mathematics in the high school for one semester or more. When the tests were given at the close of the first semester they were considered to be failing in mathematics.

From the results secured a number of correlations were computed, which are presented herewith. The 39 pupils (5 freshmen, 21 sophomores, 11 juniors, 2 seniors) who took both tests were slightly above the average in general intelligence as their C. B.'s[1] show. The latter were distributed as follows:

C. B.'s	65–74	75–84	85–94	95–104	105–114	115–124	125–134	135–144
No. Pupils	2	2	6	9	9	7	3	1

A number of the pupils did not take all of the Rogers tests. No one took fewer than three of the six, while most of the pupils had four, five, or all of them. Not one of the tests was taken by fewer than 32 of the 39 pupils. To obtain the general Rogers score, scores in the various Rogers tests taken by each pupil were weighted and averaged. For this composite Rogers score and the Otis point score, $r = 0.41 \pm 0.09$.

The magnitude of this coefficient of correlation together with the fact that practically none of these pupils are carrying work in mathematics successfully, indicates that the failure to do successfully secondary mathematics depends upon some factors other than general intelligence. This is even more clearly shown in the correlation tables. It is probable that the attitude of the pupils toward mathematics is a potent factor. It is also likely that diagnosis and remedial instruction might have assisted a number of the pupils. On the other hand it may be that mathematics requires a special type of intelligence and that the scores secured by the means of general intelligence tests can be used only for a general survey of pupils with respect to their probable success in mathematics.

It was thought that the correlation between tests 5 and 6 (Arithmetic and Geometrical Figures) of the Otis Scale and the Rogers tests would be rather high; but only a moderate degree of correlation was found, although higher than for the general Rogers score. The Rogers tests with the scores in Otis tests 5 and 6 combined gave $r = 0.54 \pm 0.08$; with test 5 (Arithmetic) alone 0.53 ± 0.08; and with test 6 (Geometrical Figures) 0.41 ± 0.09. It had been expected that the highest correlation found would be between the Rogers Geometry Test and the Otis test on Geometrical Figures. In this case, however, $r = 0.35 \pm 0.10$, showing but a low degree of correlation.

Correlations were computed between the total Otis scores and those on each of the Rogers tests. They are as follows:

Otis with Rogers Algebraic Computation, $r = 0.37 \pm 0.10$
" " " Geometry $r = 0.17 \pm 0.12$
" " " Interpolation $r = 0.58 \pm 0.08$
" " " Superposition $r = 0.02 \pm 0.12$
" " " Mixed Relations $r = 0.47 \pm 0.09$
" " Trabue Language, L. &. M $r = 0.52 \pm 0.09$

It will be observed that the Interpolation Test shows the highest degree of correlation with general intelligence as revealed by the Otis scale, whilst Geometry and Superposition seem to have no relation thereto. Of course, the number of pupils tested was

[1] The C. B. (coefficient of brightness) is similar in meaning to the I. Q. In this report it may be given the same meaning.

too small to be at all conclusive, but the results at least indicate a probability that certain correlations and absences of correlation exist.

WALTER S. MONROE

Effect of Grade Distribution upon Coefficient of Correlation

In interpreting the coefficient of correlation between two traits, it is not generally recognized that the manner in which pupils are distributed among the different school grades is a potent factor in determining the magnitude of the coefficient. Recently the Bureau of Education had the Illinois General Intelligence Scale given to a considerable number of pupils in grades II to VIII. The coefficient of correlation between the scores upon the intelligence scale and the chronological ages was calculated for each grade separately and for all grades combined. The resulting coefficient and the number of pupils upon which they are based are given in the table below:

CORRELATION BETWEEN GENERAL INTELLIGENCE AND CHRONOLOGICAL AGE

Grade	No. Pupils	r	P. E.
II	110	−.12	.063
III	927	−.06	.022
IV	1,088	−.20	.019
V	1,146	−.22	.019
VI	1,625	−.22	.016
VII	1,762	−.24	.016
VIII	1,285	−.26	.018
All grades	7,943	+.55	.005

The coefficients of correlation for the several grades are all negative. In grades II and III the coefficient, when compared with the P. E., is so small that it can be interpreted only as indicating no correlation. In all the other grades, the coefficient of correlation, while small, is large enough to be significant. The negative correlation shown is in agreement with other investigations covering this point.

The coefficient of correlation for all grades combined is positive and large enough in comparison with its P. E. to indicate a very distinct positive correlation. This, again, is in entire accord with other investigations of the correlation between the general intelligence and the chronological age of pupils when a number of school grades were combined.

We have in this table a very striking illustration of the effect of using data secured from pupils belonging to more than one grade. When taken separately by grades the traits concerned here yielded negative coefficient; when combined, the coefficient is positive. This indicates the great necessity for investigators to exercise due care in interpreting the coefficient of correlation that may be obtained. Very clearly, one can obtain widely different coefficients of correlation by using pupils that are distributed differently among the several school grades.

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